Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Operating Instructions

STIP-scan

Analyzer
10008710ED

BA 420C/24/ae/01.07

Endress+Hauser

People for Process Automation

(This page intentionally left blank.)

1 Introduction

1.1 Structure of this manual

This manual contains information about the installation, programming, and operation of the STIP-scan analyzer system. The manual consists of six chapters:

Chapter 1: Introduction, design, and applications of the STIP-scan analyzer system
Chapter 2: Safety regulations and an explanation of the safety symbols
Chapter 3: Setting up and commissioning
Chapter 4: Decommissioning
Chapter 5: Maintenance and Servicing
Chapter 6: Troubleshooting

1.2 Design of the STIP-scan analyzer system

Fig. 1.2-1: STIP-scan probe and panel-PC in weather protection housing

The STIP-scan analyzer system consists of a probe, a connection cable, and a controller. It can be mounted on a stand or by a wall bracket.

The probe is placed into wastewater and spectroscopic measurements are taken. The data is transferred to the controller and displayed on the screen.

Data is stored in the controller and can be output via analog signal.

The probe can be manually controlled and monitored, using the keyboard and display.

1.2.1 Probe

Fig. 1.2.1-1: Exterior view of probe

The STIP-scan probe components are enclosed in a stainless steel casing.

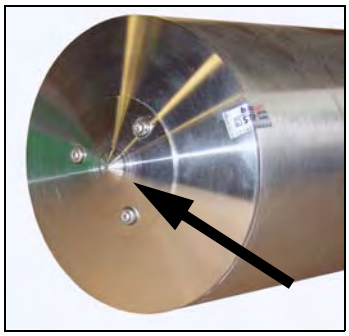

Fig. 1.2.1-2: Protective flange

When the stainless steel lower casing is removed, the interior components of the probe are visible:

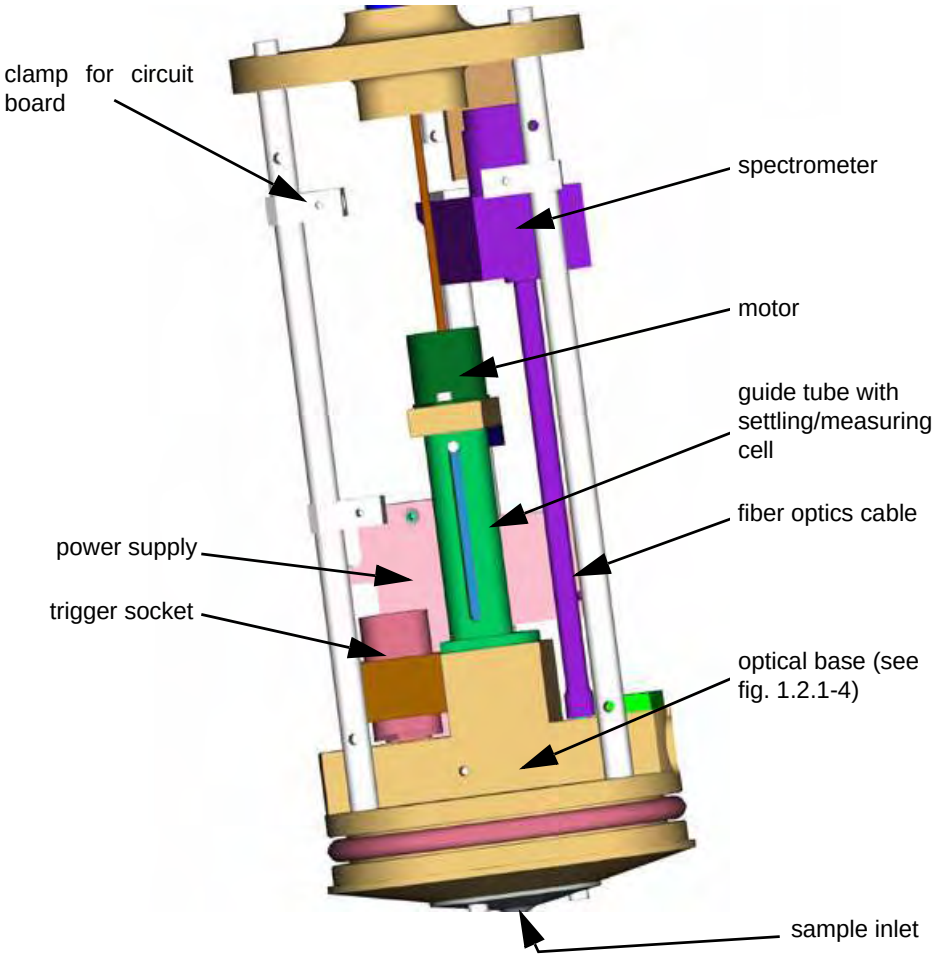

Fig. 1.2.1-3: Internal design of STIP-scan probe

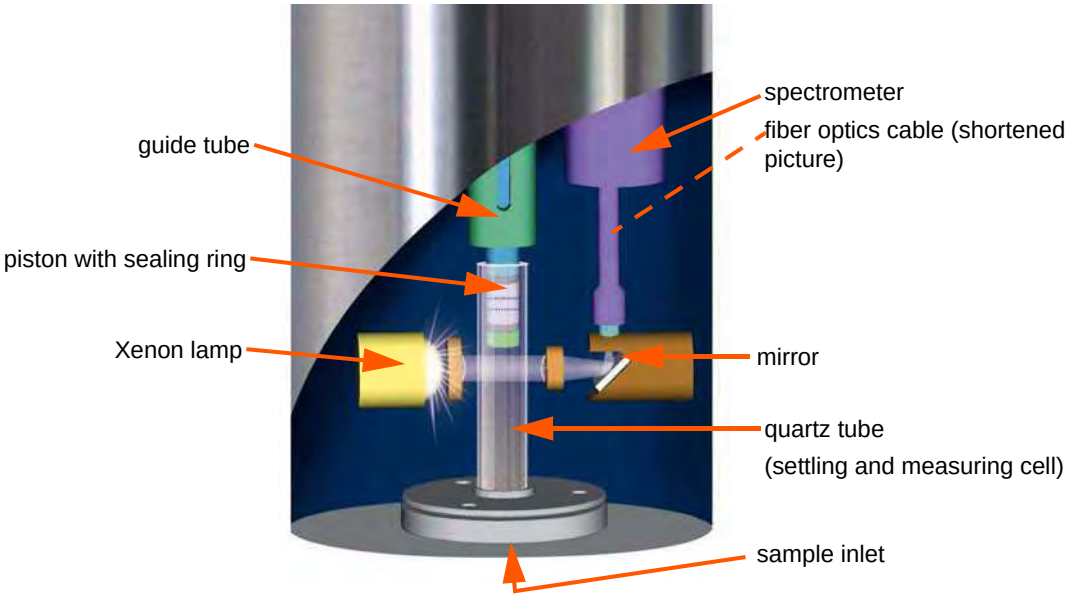

Fig. 1.2.1-4: Detailed view of the optical base and guide tube

The following table describes the components of the STIP-scan probe:

Tab. 1.2.1-1: Components of the STIP-scan probe

component	function
circuit board	Distributes energy, stores and transmits data, controls all internal probe operations from sample taking to presentation of measured results.
power supply	Supplies energy for the probe.
trigger socket	Controls the Xenon flash lamp.
spectrometer	Separates the transmitted light into discrete wavelengths and generates a signal proportional to the intensity for each wavelength.
fiber optics cable	Carries the transmitted light to the spectrometer.
motor	Drives the piston that draws the sample.
guide tube with piston	Fills and empties the measuring cell. The sealing ring on the piston mechanically cleans the inside surface of the quartz tube.
quartz tube	Settling and measuring cell. Sludge settling and light absorbance take place inside the quartz tube.
optical base	Holds all optical parts - Xenon lamp, lenses, quartz tube, mirror.
Xenon lamp	Pulses light with wavelengths from 190 nm to 720 nm.
sample inlet	Point of entry to the measuring cell.

1.2.2 Controller

Fig. 1.2.2-1: Panel-PC with peripheral units in weather protection housing

The controller serves to regulate and control all connected STIP-scan probes. In addition to the controlling and parameter measurement, the controller handles the operational control of all programming and test routines. Multitasking capability allows simultaneous handling of special and routine operations (e.g. view the stored data without interrupting the ongoing analysis). The measured data are shown, as well as values over the last 24 hours (or 3 hours), on the panel-PC display in graphical form.
By touch screen input the analyzer can be adjusted to the conditions of the monitoring place and all probes can be controlled.

The controller of the STIP-scan is a panel-PC with additional peripheral units for the control and operation of the STIP-scan probes and for data transfer to external control computers. The addition units are, e.g. the power supply of the probe, controller, and modules, as well as the RS232/RS485 converter module. The panel-PC and the peripheral units are placed in a stainless steel weather protection housing that protects the controller against wind, rain, cold and heat.

Peripheral units

Standard equipment of the weather protection housing includes the panel-PC, power supplies of the panel-PC and probe(s), a mains filter, and an RS232/RS485 converter module (one module per probe).
The standard equipment can be extended by:

- 1 and/or 2 analog output modules for data transfer by two and/or four analog outputs (per probe)
- 1 digital output module for data transfer by max. seven relay contacts (per probe)
- 1 Fieldbus module.

1	optional modules of probe #1 (not shown)
2	optional modules of probe #2 (double-probe system, not shown)
3	mains filter
4	RS232/RS485-converter module of probe #1
5	RS232/RS485-converter module of probe #2 (double-probe system, not shown)
6	power supply of probe #2 (double-probe system, not shown)
7	power supply of probe #1
8	power supply of panel-PCs and of all modules

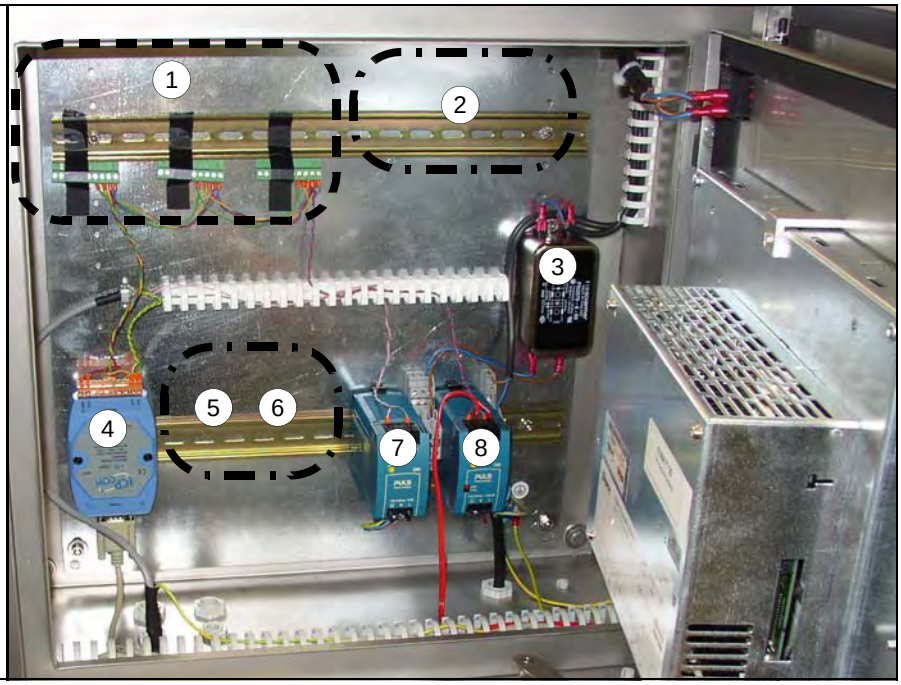

Fig. 1.2.2-2: Peripheral units (on assembly plate) of panel-PC

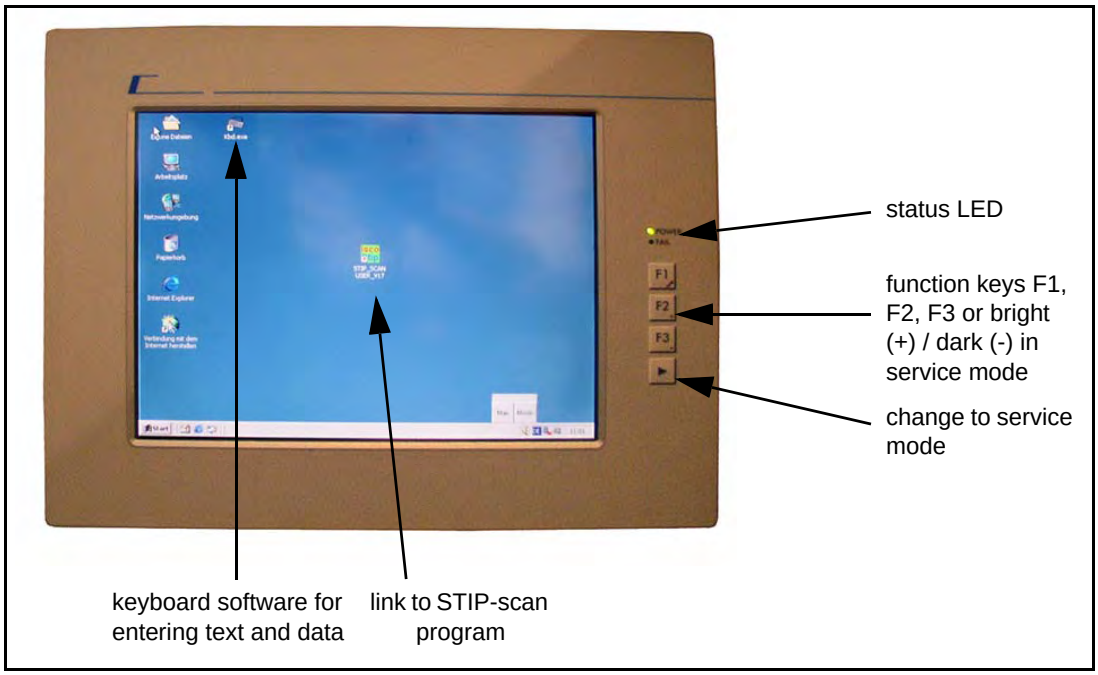

Fig. 1.2.2-3: Panel-PC front view

The functions of the panel-PC keys are described in the following table:

Tab. 1.2.2-1: Explanations of the front panel, keys, and LEDs of the panel-PC

Power-LED	The power LED is green if the power is on. If the LED is flashing, you are in the service mode where the backlight brightness can be set.
Fail-LED	The fail-LED is red if there is an error in the DC/DC-changer. If the red LED is flashing, then there is no display signal.
F1	In standard mode, this function key sends the key code for “F1“.
F2 / +	In standard mode, the function key sends the key code for “F2“. In service mode, this function key increases the display brightness.
F3 / -	In standard mode, the function key sends the key code for “F3“. In service mode, this function key decreases the display brightness.
▶	To get into the service mode you must push the ▶ button until the green power-LED is flashing. While the LED is flashing, you can set the display brightness. To exit the service mode, push the ▶ button again or wait 30 sec.

The Windows 2000 operating system, the software for controlling the STIP-scan and a keyboard-software for entering text and data are factory-installed. Drivers for peripherals (analog outputs, relay contacts, etc.) are also installed on the hard drive. No other software is required for operating the STIP-scan.

Use the touch screen of the panel-PC and the keyboard-software (see below) for working with the STIP-scan program (see fig. 1.2.2-4 on page1-6).

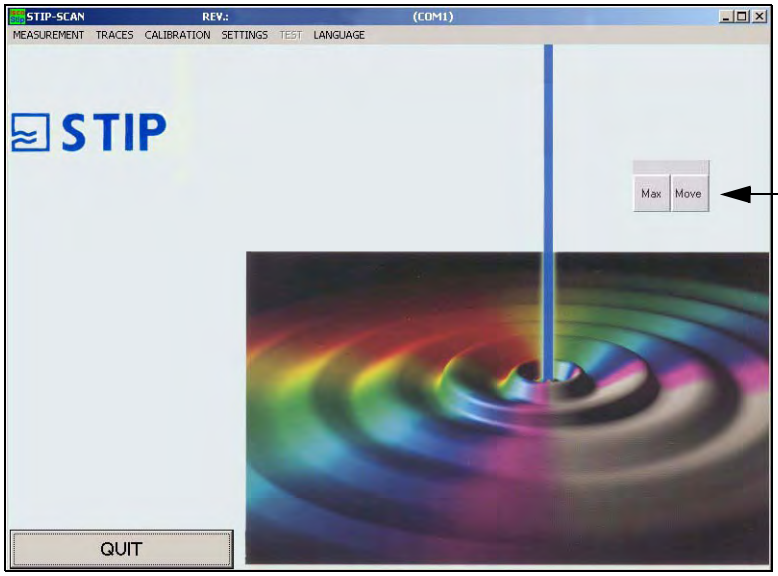

Fig. 1.2.2-4: Screen keyboard (displayed as a symbol)

The buttons "***Max***" and "***Move***" show the keyboard software as a symbol. Use the button "***Move***" for moving the screen. Push the "***Max***" button to activate/open the keyboard software:

Fig. 1.2.2-5: Keyboard-software

Text and data can be entered into the STIP-scan program by pushing the corresponding buttons of the keyboard.

NOTE

Move the keyboard by pushing the button"***Move***", reduce the keyboard by pushing the button "***Min***" and close the keyboard-software with the "***Close***" button.

NOTE

An external mouse or keyboard can be connected to the panel-PC. The connections of the panel-PC are shown in chapter 1.2.5, "Technical data" , fig. 1.2.5.2-2 on page1-15.

During measurement, the screen shows the current measured values as well as values over the last 24 hours (or 3 hours) in graphical form. The screen also displays any faults, which are recorded in memory. Any infringements of the set limits are signalled by the respective floating signal outputs and in the display.

To start the STIP-scan software, proceed as described in chapter 3.3.1, "Starting the panel-PC and the STIP-scan software" (page 3-7).

1.2.3 Connection cable

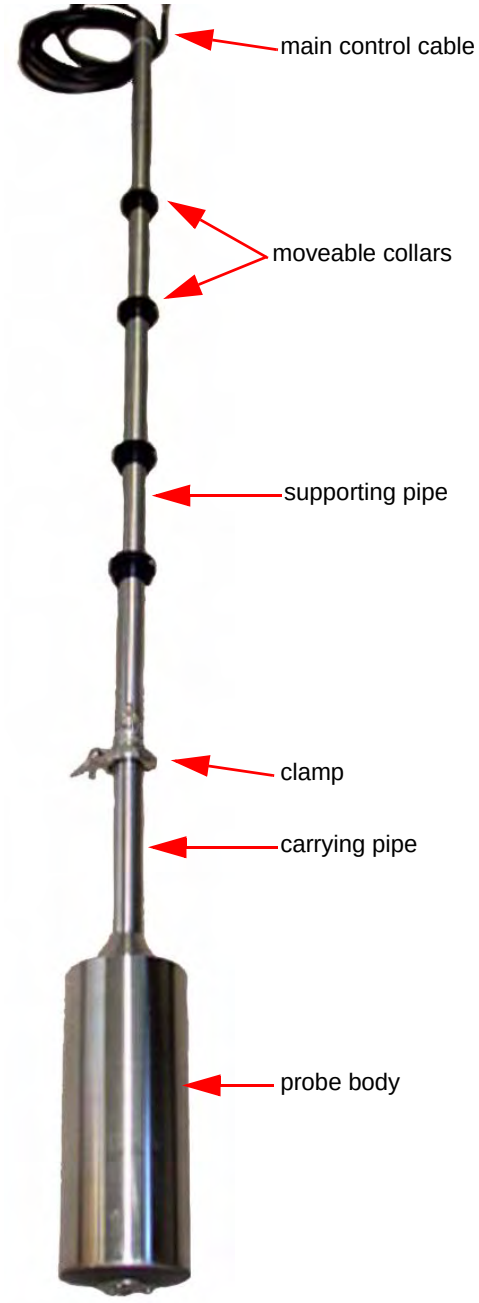

Fig. 1.2.3-1: Probe connected with connection cable

The connection cable consists of a supporting pipe and a main control cable. The main control cable consists of a power supply cable and a data transfer cable.

Main control cable

The main control cable transfers power and data between the probe and the controller. It is connected via a ten-pin cable plug inside the supporting pipe. The other end of the main control cable is connected via a seven-pin cable plug to the controller.

Supporting pipe

The carrying pipe is anchored to the supporting pipe by a clamp. With the aid of the supporting pipe, the probe is attached to the stand and raised and lowered into the wastewater.

1.2.4 Function and procedure

1.2.4.1 Measuring Cycle

Each measuring cycle consists of the following steps:

Step 1: Sampling

The wastewater sample is drawn into the settling/measuring cell by a piston that is driven up and down inside the quartz tube.

Step 2: Settling and measurement of sludge parameters

The suspended material starts to settle. The dynamics of the settling process are monitored by the spectrophotometer by measuring the absorbance of visible light from the Xenon lamp as settling proceeds.

Step 3: Determination of the concentration of nitrate-nitrogen, SAC, and organic load

a) Sludge parameters

The determination of sludge parameters is based on the observation of the sludge settling. The first step includes the calculation of the content of total solids. In the second step the analyzer monitors the settling curve of the sludge and calculates the sludge volume. As a result of both the TS and SV, the sludge index (SI) is calculated.
NOTE: In some measuring sites, there will be no sludge parameter, due to no sludge being present, or no sludge settling.

b) Nitrate-N and organic load

Since particulate matter in the waste water sample may reduce the accuracy of the measurement by light scattering, nitrate-N and load parameters are determined after the settling process in the clear water zone. Both the nitrate concentration (NO_3-N) and the spectral absorbance coefficient (SAC) are measured directly by monitoring the absorbance of discrete UV wavelengths. The chemical oxygen demand (COD) and the total organic carbon (TOC) are calculated by correlation analysis.

Step 4: Termination

After measurement has been completed, the piston expels the sample from the quartz tube, and the analyzer is ready to start a new cycle. The entire process takes between one and ten minutes, depending upon the settling behavior of the sludge.

1.2.4.2 Measurement process

Basics of spectrophotometric measurement

Spectrophotometry makes use of the phenomenon whereby light radiated through a solution is reduced in intensity (transmitted-light measurement). The theory of light absorbance is described by the Bouguer-Lambert-Beer's Law. The absorbance is substance-specific and depends on the concentration of the absorbing material as well as on the specific wavelength of the light used. In addition, absorbance is fundamentally different at different wavelengths, so that every substance that absorbs has a more or less characteristic absorbance spectrum.

Common photometry relies upon the measurement of absorbance at a single wavelength. Spectrophotometry uses absorbance measurements over the whole absorbance spectrum. It provides much more spectral information than the common photometric approach.

For spectrophotometric analysis, the phenomenon of the light absorbance is theoretically formulated by the Bouguer-Lambert-Beer's law. According to this law, the molar concentration *c* of a substance that absorbs light at a wavelength λ is directly proportional to the absorbance *A*:

$$A_\lambda = k \times c$$

The proportional constant k is the product of the spectral molar absorbance coefficient ε_λ (unit: $l * mol^{-1} * cm^{-1}$) of the substance for the wavelength λ and the length of path *d* of the measuring cell:

$$k = \varepsilon_\lambda \times d$$

Thus:

$$A_\lambda = \varepsilon_\lambda \times c \times d$$

In spectrophotometry, the function A_λ corresponds to the absorbance spectrum of the absorbing substance. For liquid containing several light absorbing substances, each compound provides a single absorbance spectrum. In this case, A_λ is the absorbance trace of the analyzed liquid being the sum of the single overlapping absorbance spectra. Usually, the measured value is expressed as the spectral absorbance coefficient having the unit 1/cm:

measured value $\frac{A_\lambda}{d} = \varepsilon_\lambda \times c$

The advantage of this is that the spectral absorbance coefficient is typical for the absorbing medium without the concentration and the molar absorbance coefficients of the absorbing substances being known. As an example, the specific absorbance at 254 nm is equal to the well-established sum parameter SAC_{254}.

Measuring principle of the STIP-scan

The concentration of the parameters nitrate, SAC_{254} (spectral absorbance coefficient), COD, TOC, TS, SV, SI, and ATU (attenuation turbidity units), is based on the spectrophotometric absorbance measurement (transmitted-light measurement) in a wavelength range between 190 nm and 720 nm. The light source is a Xenon flash lamp with an emission spectrum from the UV range, through the visible, to the infrared range. The light that passes through the wastewater sample is attenuated in a distinct manner. Finally, the transmitted portion of the light is focused on a mirror and directed via fiber-optic cable to the entrance slit of a miniaturized photodiode array spectrometer. The spectrometer measures the spectral distribution of the light intensity. The intensities of selected wavelengths are used to calculate the concentration of the absorbing substances.

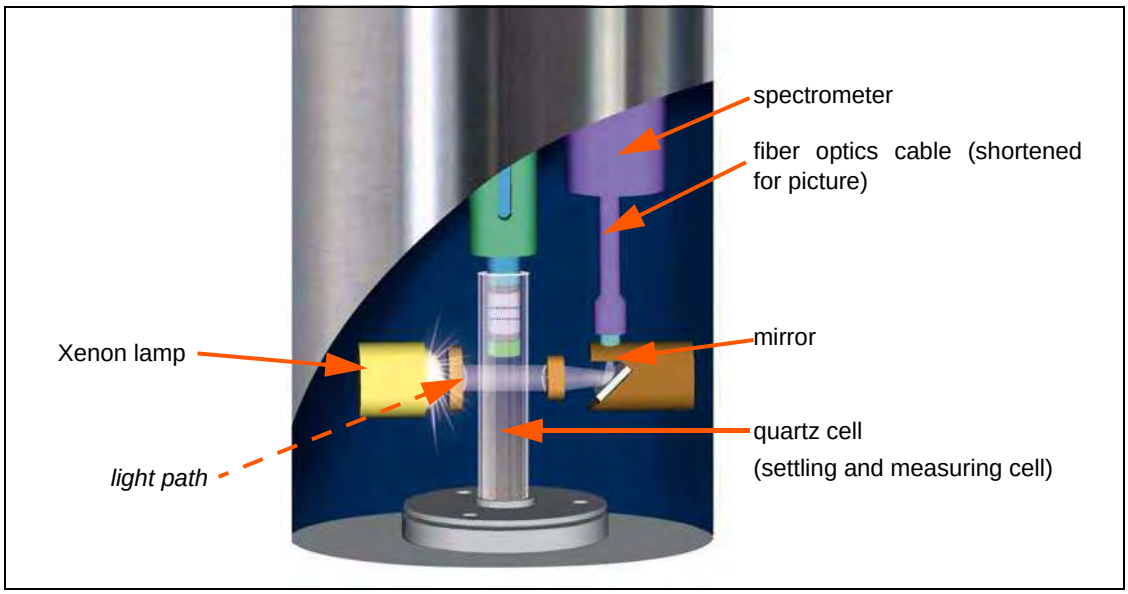

Fig. 1.2.4.2-1: Optical design of the STIP-scan probe

Determination of sludge parameters

As soon as the wastewater sample is drawn into the quartz cell, particles and sludge flocs start to settle. This process is followed by measuring the absorbance of transmitted visible light. The initial “constant” level is used to derive the total suspended solid (TS) of the sludge.
The shape of the settling curve is used to derive sludge volume (SV). Sludge index (SI) is calculated from SV and TS.

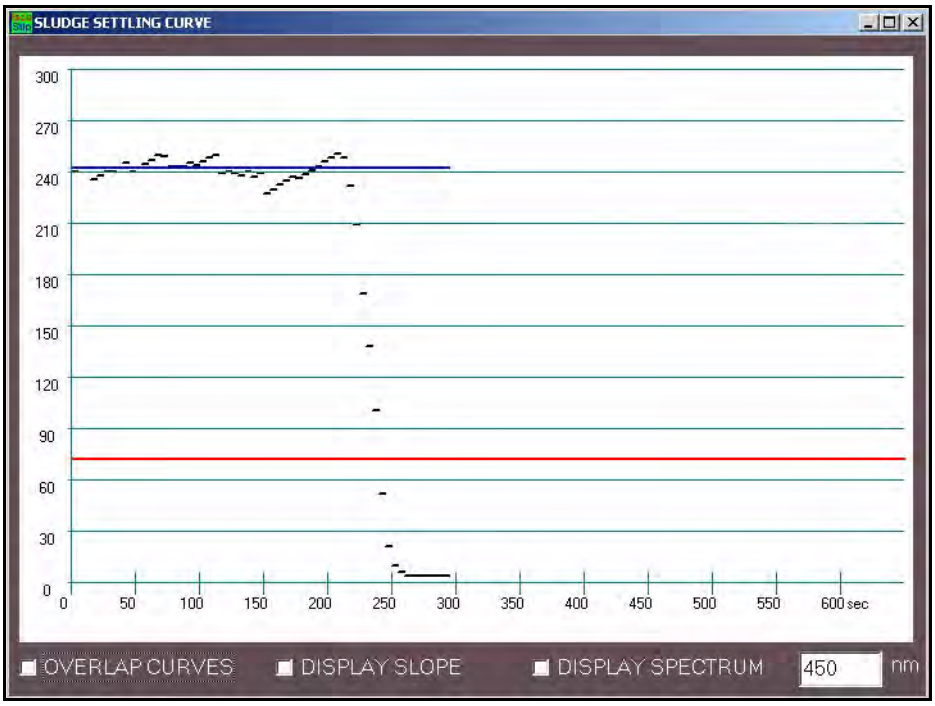

Fig. 1.2.4.2-2: Sludge settling curve

Determination of nitrate

Nitrate determination is based upon the absorbance spectrum between 200 and 230 nm. Mathematical algorithms are used to cancel out absorbance from dissolved organic material that would otherwise interfere with the nitrate measurement (see fig. 1.2.4.2-2, page 1-11).

Determination of SAC_{254}

SAC_{254} is a parameter originally developed for drinking water which depends upon the absorbance of dissolved organic compounds. When used with wastewater, it can give an indication of TOC and COD. As an indicator of organic load, it is limited because it measures absorbance at just one wavelength.

Determination of COD

The absorbance of the wastewater sample is measured over the range of 200-400 nm. A mathematical algorithm is used to cancel out the absorbance due to nitrates which would otherwise interfere with the COD measurement.

Determination of TOC

The absorbance of the wastewater sample is measured over the range of 200-400 nm. A mathematical algorithm is used to cancel out the absorbance due to nitrates which would otherwise interfere with the TOC measurement.

Determination of the turbidity (ATU)

The turbidity is determined by detecting the scattered light as a reduction of the transmitted light at a defined wavelength. The expression of the turbidity value is in ATU (attenuation turbidity units).

User-Specific Conditions

The “plus” module allows the customer to monitor absorbance changes across the whole spectrum. Installed at the inlet to a plant, STIP-scan will help identify changes occurring in the water matrix and permit alterations to be made to the treatment process. STIP-scans installed at key positions throughout the process will aid with optimizing treatment.

Interferences with spectrophotometric measurement

Common interferences in the spectrophotometrical measurement are due to the loss of light intensity of the Xenon lamp, deposits on the inner surface of the quartz cell, and discolorations of the optical windows. During the filling and emptying of the sample chamber, deposits on the inner surface of the quartz cell are removed mechanically by the up and down movement of the piston equipped with special sealing rings.

1.2.4.3 Calibration

The aim of calibration is to create a valid correlation between the actual measured quantity (absorbance of the waste water sample) and the analytical target quantity (concentration of the chosen parameter) for a given instrumental setup. Basically, the conversion factor is determined by performing measurements with several standard solutions having known concentrations of the analytical target quantity. According to the Bouguer-Lambert-Beer's Law (see “Basics of spectrophotometric measurement” on page 3-9) the conversion factor is then used in the operation mode to calculate the concentration from the measured signal.
The STIP-scan system can be adjusted to the special conditions of a waste water treatment plant. For this, a two-point calibration is to be made. The user enters a defined number of measuring data into the STIP-scan software, and the system calculates an optimized linear algorithm for the quantification of the required parameter.
For special applications a non-linear algorithm may be recommended. In this case, STIP Isco uses the customer specific data to develop a polynomial algorithm. The customer will be provided with the non linear mathematical approach that is adjusted individually to the user-oriented requirements of the waste water treatment plant.

NOTE

More information how to calibrate the system is in chapter 3.3.4 on page 3-18.

1.2.5 Technical data

Dimensions and weight

	dimensions			weight (gross)
probe	height: diameter:	300 mm 120 mm	(11.81 in.) (30.48 in.)	7.5 kg (16.5 lbs)
protective housing and panel PC	width x height x depth			
	520 x 260 x 520 mm 390 x 300 x 100.5 mm		(20.5 x 10.2 x 20.5 in.) (15.4 x 11.8 x 4.0 in.)	25 kg (55.2 lbs) 4.8 kg (10.6 lbs)

(The dimensions are without peripheral units, i.e. modules.)

Data storage and output

hard disk	storage of all measured data, sludge- and calibration data as well as status and error protocols
optional signal outputs	one OR two analog interfaces (per probe) with two analog outputs each, 0/4 mA - 20 mA, galvanized separation, max. load 1050 ohms, power supply 10 - 30 V DC
optional relay outputs	upto seven voltage free contacts (max. 0.5 A at 120 V AC or 1 A at 24 V DC), normally open (just in combination with one analog output module; max. one relay output module per probe)
optional Fieldbus connection	transmission of all measuring and status data by Profibus DP-V1 or DP-V0

Electrical connections

mains power, controller	230 V or 115 V, 50 cps (50 Hz) or 60 cps (60 Hz)
power supply, probe	24 V DC (via connection cable)
power consumption, probe	approx. 2.2 W / 90 mA in idle mode approx. 4.3 W / 180 mA operation of flash lamp approx. 9.2 W / 380 mA at operating the motor
enclosure, probe	IP67
enclosure, weather protection housing	IP65 (panel-PC, front, closed) IP55 (panel-PC, front, opened)
protection class	1
EMC	EN 61326
contains resistance interferences in accordance with:	EN 61000-4-2 (electrostatic discharge) EN 61000-4-3 (radiated radio-frequency field on housing) EN 61000-4-6 (radiated radio-frequency field on cables) EN 61000-4-8 (power frequency magnetic field) EN 61000-4-4 (electrical fast transient/burst) EN 61000-4-5 (surge) EN 61000-4-11 (voltage dips, short interruptions, and voltage variation)
transmission interference	EN 55011 class B (interference field, interference voltage)
certification	CE-mark (declaration of conformity)
electrical safety	EN 60335-1 (VDE 0700)

1.2.5.1 STIP-scan types and parameters

STIP-scan types

The STIP-scan analyzer measures nitrate (NO_3-N), carbon parameters (SAC, COD, TOC), and sludge parameters (sludge volume SV, total solids TS, sludge index SI), and turbidity (ATU). The following STIP-scan modules are available:

model	nitrate	carbon parameters	sludge parameters	additional spectrum
STIP-scan N	yes	no	SV, TS, SI	no
STIP-scan C	no	SAC, COD or TOC	SV, TS, SI	no
STIP-scan NC	yes	SAC, COD or TOC	SV, TS, SI	no
STIP-scan NC *plus*	yes	SAC, COD or TOC	SV, TS, SI	yes

Parameter specifications

Tab. 1.2.5.1-1: Parameter specifications

	nitrate	COD[a)]	TOC[a)]	SAC	turbidity
measured as	NO_3-N	COD	TOC	SAC_{254}	ATU
measurement range	0.3 - 23 mg/l	10 - 2000 mg/l	4 - 800 mg/l	1 - 250 m^{-1}	1 - 250 m^{-1}
detection limit	0.1 mg/l	2 mg/l	1 mg/l	0.1 m^{-1}	0.1 m^{-1}
reproducibility	3%	3%	3%	3%	3%

a) based on KHP

Tab. 1.2.5.1-2: Specification of sludge data

	total solids	sludge volume	sludge index
measured as	TS	SV	SI
measurement range	0.5 - 5.0 g/l turbidity as ATU	100 - 900 ml/l[a)]	250 ml/g

a) in diluted sample

1.2.5.2 Specification of panel-PC

To protect the equipment from adverse weather conditions, the panel-PC and additional peripheral modules are in a weather protection housing.
The panel-PC is located on a assembly plate that can be turned to the right:

Fig. 1.2.5.2-1: Assembly plate of panel-PC turned to right

The panel-PC has the following connectors on the rear panel:

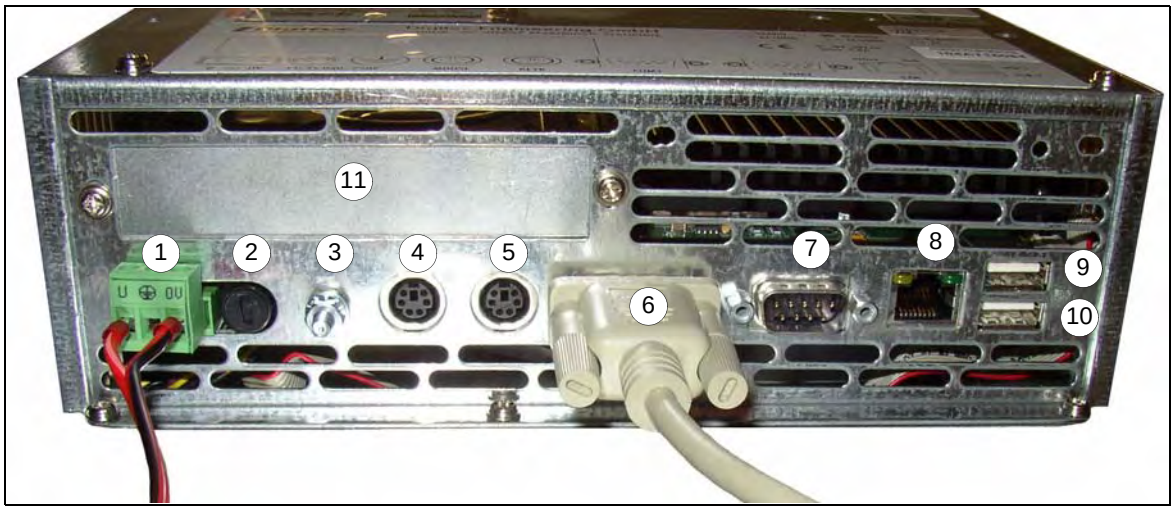

Fig. 1.2.5.2-2: Connectors of the panel-PC

Tab. 1.2.5.2-1: Assignment of panel-PC connectors

pos.	description
1	24 V PE GND, 24 V DC input voltage
2	fuse T 5,0 AH
3	earth
4	PS/2-mouse
5	PS/2-keyboard
6	COM 1 (probe 1)

pos.	description
7	COM 2 (probe 2)
8	LAN
9	USB1
10	USB0
11	optional Fieldbus card (not shown)

A second assembly plate is located inside the stainless steel protection housing. All peripheral modules are located on this assembly plate:

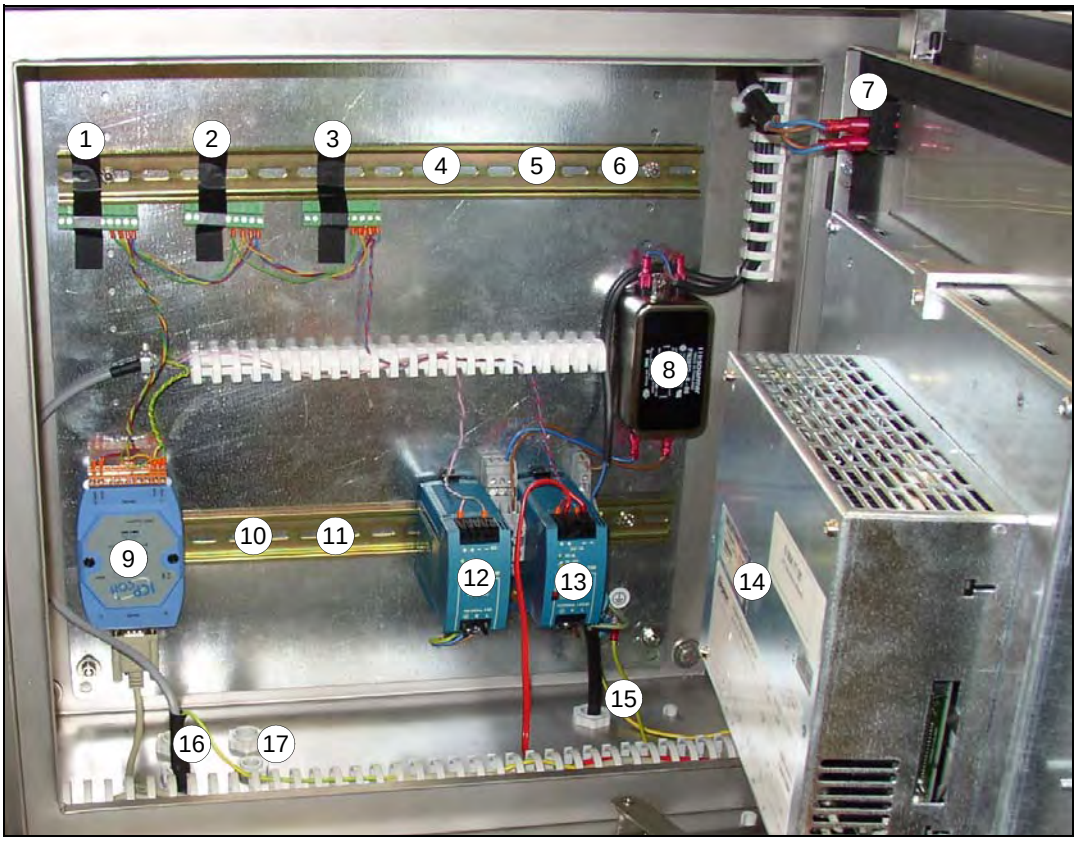

Fig. 1.2.5.2-3: Peripheral modules inside the protection housing, front view

Tab. 1.2.5.2-2: Legend to fig. 1.2.5.2-3

pos.	description
1	optional analog signal output module #1 of probe 1 (not shown)
2	optional analog signal output module #2 of probe 1 (not shown)
3	optional relay output modul of probe 1 (not shown)
4	optional analog signal output module #1 of probe 2 (not shown)
5	optional analog signal output module #2 of probe 2 (not shown)
6	optional relay output module of probe 2 (not shown)
7	mains switch connector (back of panel-PC)
8	mains filter
9	RS232/RS485 converter module of probe 1
10	RS232/RS485 converter module of probe 2 (not shown)
11	power supply of probe 1
12	power supply of probe 2 (here not shown)
13	power supply of panel-PC, modules of probe 1 and modules of probe 2
14	panel-PC (back side)
15	external power supply of controller
16	connection cable of probe 1
17	connection cable of probe 2 (not shown)

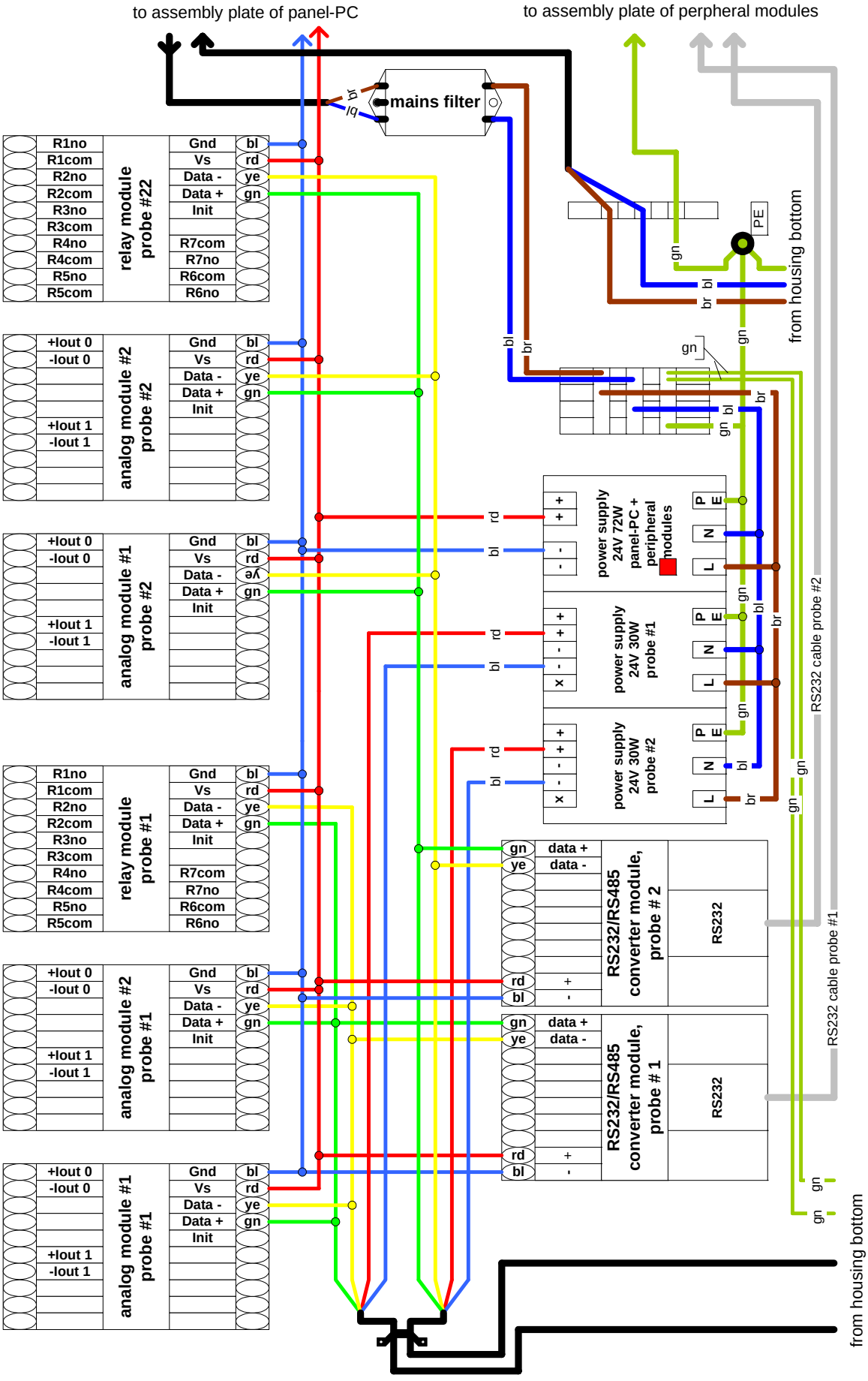

Fig. 1.2.5.2-4: Wiring diagram of panel-PC (assembly plate with peripheral modules)

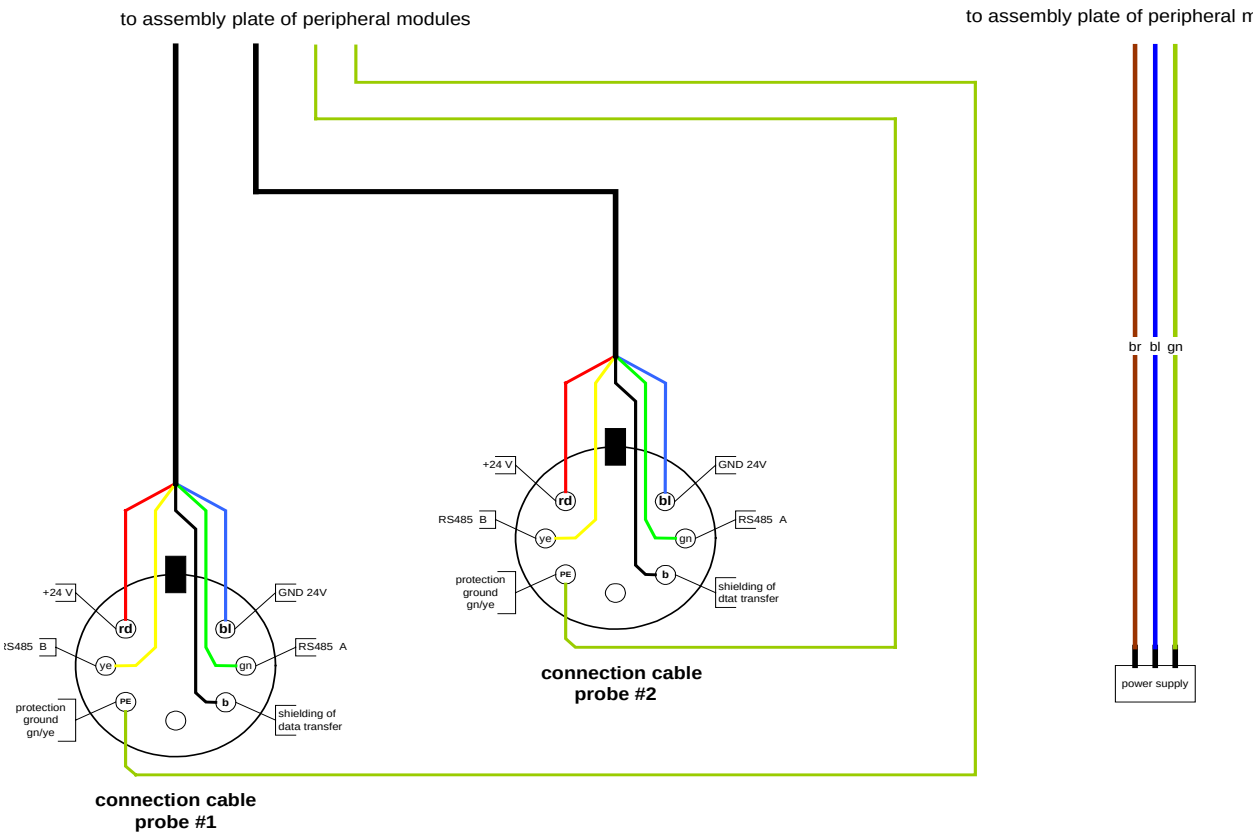

Fig. 1.2.5.2-5: Wiring diagram of panel-PC (Connectors on the housing bottom, inside view)

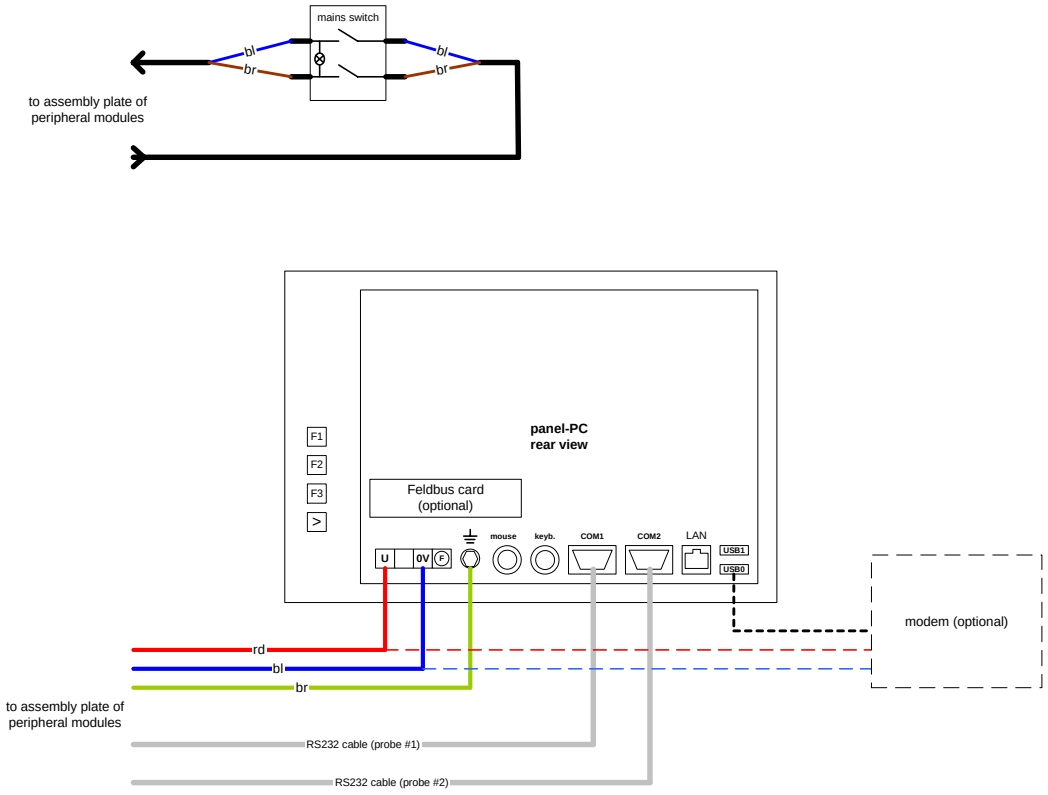

Fig. 1.2.5.2-6: Wiring diagram of panel-PC (assembly plate of panel-PC)

Panel-PC

Tab. 1.2.5.2-3: Minimum requirements to panel-PC

processor	Celeron 300 - 500 MHz
display	12" color TFT display, 800 x 600 pixel
operation/keyboard	touchscreen analog resistive; 4 front keys for application: 3 function keys (F1 to F3) and display brightness; status-LED green (power) and red (fail)
main memory	at least 128 MB
hard disk	at least 6 GB
interface	2x USB, 2x COM, 1x LAN network 10/100MBit RJ45, PS2-mouse and PS2-keyboard connectors, CF-slot, PC 104 slot internal
operating system	Windows 2000, driver for power interfaces, optional digital outputs, etc.
external power supply	power supply 115V/230V switchable
internal power supply	24 V DC, at least 70 W
power consumption	approx. 50 W / 24 V
miscellaneous	screen keyboard (by software)

RS232/RS485 converter

baud rate	300 - 115200 bps
power consumption	2.2 watts
voltage supply	10 - 30 V DC
galvanized separation	upto 3000 V DC
RS232 connection	Sub-D 9 pins plug
RS485 connection	screw terminal

Fig. 1.2.5.2-7: RS232/ RS485 converter

Analog signal outputs (option)

output channel	2, galvanized separation
output type	mA
accuracy	± 0.1 %[a)]
resolution	± 0.02 %[a)]
zero drift of current output	± 0.2 µA/°C
current load resistance	500 ohms
insulation	3000 V DC, each of channel
power supply	+10 to +30 V DC
power consumption	3.0 W

a) with full reflection

Fig. 1.2.5.2-8: Analog signal output module

Relay contacts (option)

output channels	7 (normally open)
power supply	+10 to +30 V DC
contact rating	0.5 A at 120 V AC or 1.0 A at 24 V DC
power consumption	1.5 W
min. life	10^5 operation

Fig. 1.2.5.2-9: Relay output module

Fieldbus plug-in card (option)

type	Profibus DP Slave
protocoll	DP-V0 or DR-V1 (class 1/2)
I/O storage	368 Byte
connection	nine-pin D-SUB socket
interface	RS485, galvanically isolated

2 Safety Regulations

2.1 General Instructions

Observe the indications in the operating instructions

Conditions for the safe use and trouble-free operation of this instrument require knowledge of basic safety regulations. These instructions provide information for the safe operation of this instrument. The safety instructions are to be followed by every user. In addition, attention must be paid to the local regulations on occupational safety and accident prevention.

User's obligations

The user is obligated to ensure that everyone who operates the instrument:

- is familiar with the regulations for occupational safety and accident prevention and has been trained on the instrument;
- has read and understood the safety chapter and the warnings in this manual.

Hazards when using the instrument

The STIP-scan analyzer system is built with state-of-the-art technology and in accordance with known safety rules. The instrument should only be used:

- in the way it was intended
- when the technical safety equipment is in working condition

Improper use can result in hazards to life and limb of the user or third parties. Damage to the instrument or other property may occur. Safety hazards must be corrected immediately.

Proper use

The STIP-scan analyzer systemis intended to measure nitrate, SAC_{254}, COD, TOC, TS, SV, SI, and ATU in the field of wastewater treatment and water pollution control. Any other or additional use is considered improper. STIP Isco is not liable for any damage resulting from improper use.
Proper use also requires:

- the operator to follow all instructions contained in the operating instructions
- observance of the required inspections and maintenance work

Warranty and liability

The “General Terms and Conditions“ of Endress+Hauser Conducta GmbH&Co.KG Division STIP apply. These will be made available to the operator at the latest when the contract is concluded. Warranty and liability claims for injuries to persons and property damage are excluded, if they are the result of the following causes:

- improper use of the analyzer
- unauthorized assembly, installation, operation or maintenance
- operation of the STIP-scan with damaged and/or non-functioning safety and protective equipment
- failure to observe the instructions on transport, storage, assembly, installation and maintenance
- unauthorized changes
- exceeding the prescribed depth of immersion
- insufficient monitoring of parts subject to wear
- improper repairs
- catastrophes caused by foreign bodies and acts of God.

2.2 Safety Instructions

Explanation of symbols and warnings

The following designations and symbols are used to indicate the hazards in the user manual:

DANGER

This symbol means an immediate threat of danger to life and health.

Failure to comply with these instructions may result in serious damage to health or life-threatening injuries.

WARNING

This symbol means a potential threat of danger to life and health.

Failure to comply with these instructions may result in serious damage to health or life-threatening injuries.

CAUTION

This symbol means a potentially dangerous situation.

Failure to comply with these instructions may result in minor injuries or property damage.

INFORMATION

This symbol gives important instructions on how to operate the instrument properly.

Failure to comply with these instructions may result in malfunctions of the instrument.

NOTE

Under this symbol you are given instructions, tips, and useful information.

2.3 Safety Equipment

All safety equipment must always be properly mounted and operable before installation and operation.

Safety equipment may only be removed:

- during maintenance and repair work and after disconnecting the power supply
- after securing the device against restarting

When component parts are supplied, the safety equipment must be mounted properly by the user.

DANGER

Bolted-on safety screens and barriers must not be removed when the equipment is running.

Passive protection devices:

- Protection cover IP67 (dust tight and water tight) for the probe.
- Protection cover IP65 or IP55 for the weather protection housing of the panel-PC (front, closed or opened).

2.4 Informal safety measures

The manual should be permanently kept near the operating location of the device.
In addition to the manual, the applicable and the local regulations on accident prevention and environmental protection should be provided and observed.

2.5 Personnel training

Only trained personnel should work with the device.
The responsibilities of the personnel for assembly, commissioning, operation, setup, maintenance, and service must be clearly defined.
Trainees may only work with the device under the supervision of an experienced operator.

2.6 Device control

Only authorized trained staff should be allowed to adjust or change production values using the device controls.
Changes must not be made to the software by the operator under any circumstances.

2.7 Hazards from electric power

Work on the power supply should only be carried out by a certified electrician. The electrical equipment of the device must be checked regularly. Loose connections must be tightened and defective parts replaced immediately. Always switch off the main power switch when working on electrical components.

2.8 Particularly dangerous parts

The STIP-scan analyzer system is designed and manufactured with the greatest possible care and in accordance with state-of-the-art technology and science. Nevertheless, there are remaining risks and dangerous parts which cannot be eliminated. Risks and dangerous parts are described throughout this manual.

2.9 Maintenance service and trouble-shooting

Follow all regulations to prevent accidents.

2.10 Changes to device

No changes, additions, or modifications may be carried out on the device without the manufacturer's approval.
All conversion measures require written confirmation from Endress+Hauser Conducta GmbH&Co.KG Division STIP.
Any device parts not in proper condition must be replaced immediately.
Use only replacement parts provided by Endress+Hauser Conducta GmbH&Co.KG Division STIP.
If parts from other manufacturers are used, there is no guarantee that they are designed and manufactured in conformance with the loading and safety specifications of the original equipment parts; therefore, the warranty will be void.

2.11 Cleaning the analyzer

The required substances and materials must be used and disposed of properly.

2.12 Disposal of the analyzer

The analyzer contains electronical components. This components must be disposed as electronic industry waste. Follow in paricular the local disposal regulations of your country.

2.13 Device noise

The continuous sound level emitted by the device is < 70 dB (A).

2.14 Copyright

3 Commissioning

3.1 Transport and Storage

3.1.1 Delivery scope and damage in transit

The completeness of the components supplied should be checked against the delivery documentation.
In addition, the equipment should be checked for possible transit damage and loose components.

3.1.2 Storage

When storing the equipment for an extended period, observe the following:

- the storage time should be as short as possible
- equipment should be stored in a dry area
- use suitable packaging (e.g. protective covers)

3.2 Installation

The STIP-scan analyzer system consists of a probe unit, connection cable, and a controller. The converter and the controller are in weather protection housing that can be located independent of the probe unit at the waste water treatment plant site. The probe can be mounted on a stand or a wall bracket (optional).
The following chapters deal exclusively with stand mounting. Should you have any questions about wall mounting, please contact Endress+Hauser Conducta GmbH&Co.KG Division STIP.

3.2.1 Securing to Stand

The stand must be secured on concrete using four screws with anchors. We recommend anchor fittings (part-# 91407702). Endress+Hauser Conducta GmbH&Co.KG Division STIP cannot be held responsible for incorrect set up.

For correct operation:

- The computer must be readily accessible.
- 230 V, 50 cps (50 Hz) (optional 115 V, 60 cps (60 Hz)) must be available.
- Ambient temperature must be between -10°C (-23°F) and +40°C (+5°F) for the panel-PC (in weather protection housing, closed).
- The probe must be installed so that the inlet is a minimum of 10 cm (4 inches) below the surface.

3.2.2 Overview

To set up the STIP-scan:

- Assemble and install the stand and protective housing (chapter 3.2.3, page 3-2)
- Connect the cables (chapter 3.2.4, page 3-5)

The setup follows the initial start-up of the analyzer according to chapter 3.3, page 3-6.

3.2.3 Assembly and installation of the stand and housing

Assembly and installation requirements:

- concrete drill bit Ø14 mm (0.55 in.)
- drill
- wrenches: 19 mm (0.75 in.), 2x 17 mm (0.67 in.), 2x 13 mm (0.51 in.)
- accessories for the stand

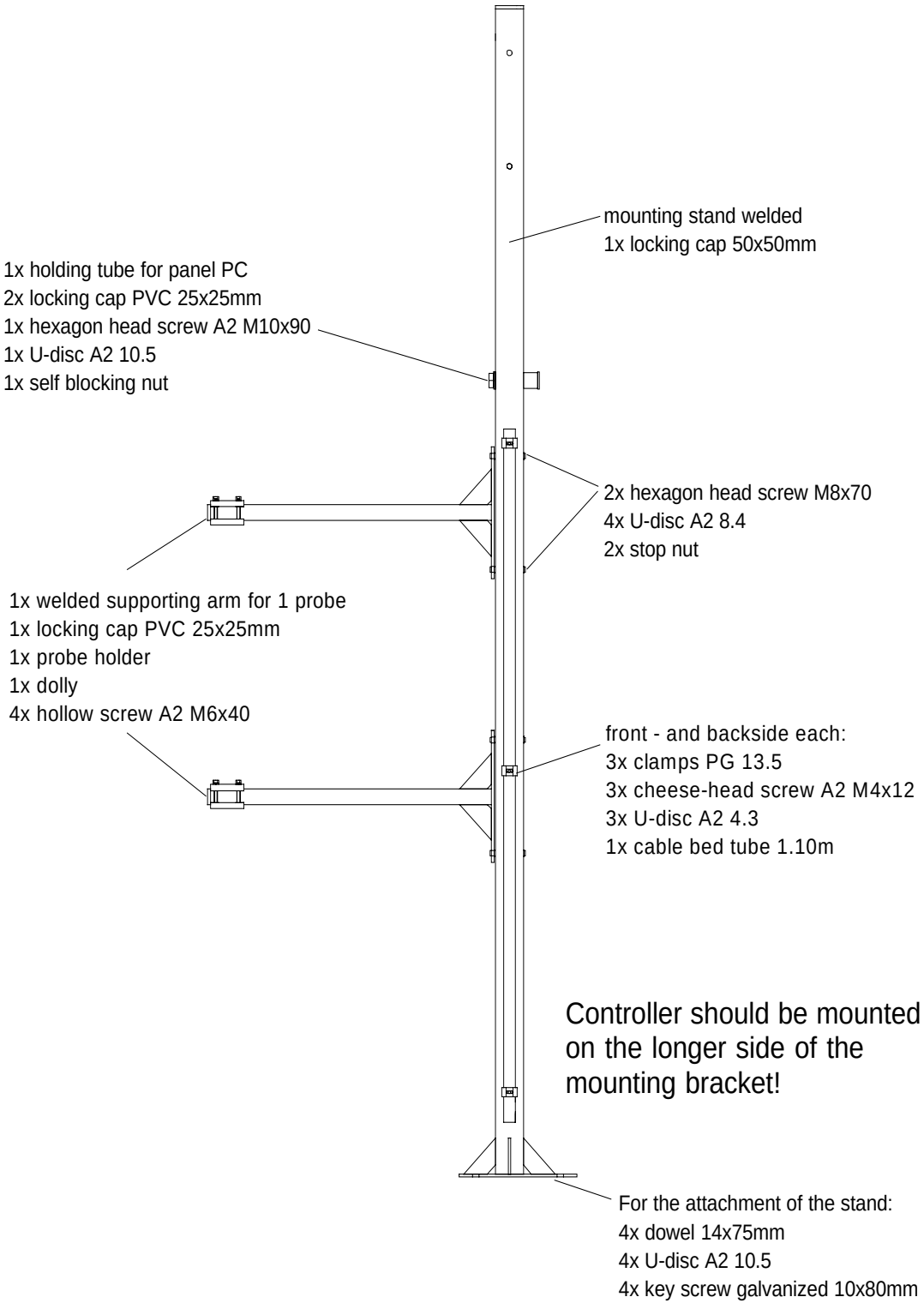

Fig. 3.2.3-1: Construction of stand

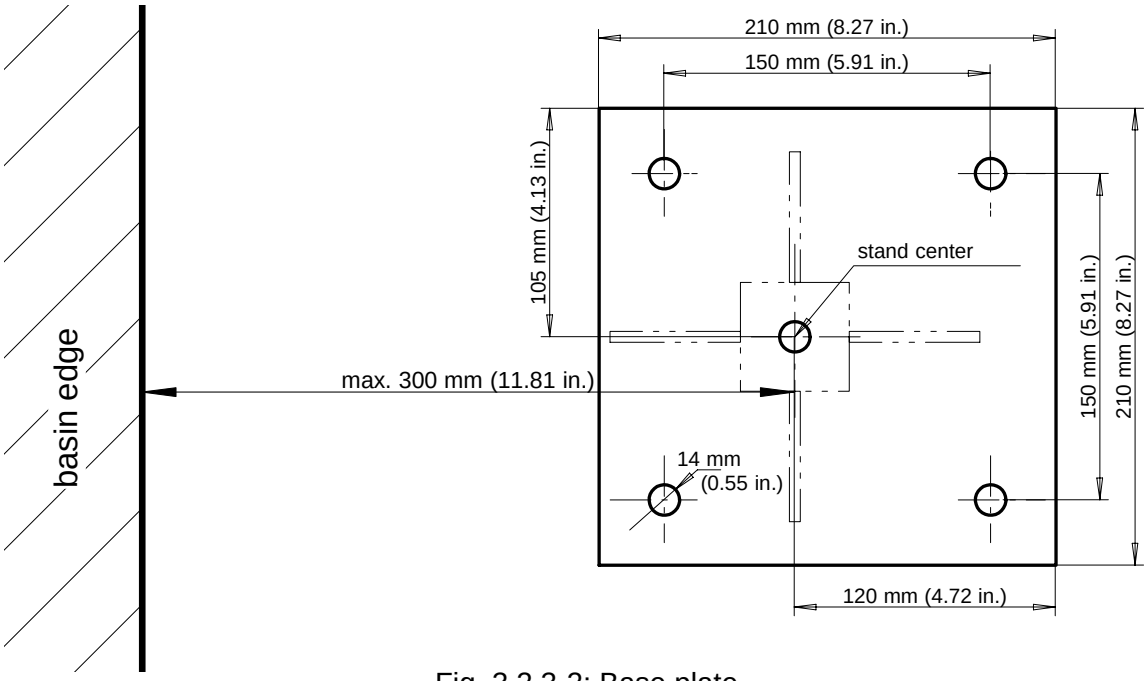

Fig. 3.2.3-2: Base plate

Fig. 3.2.3-3: Stand

- Set the stand (fig. 3.2.3-3) in position.
- Mark and drill the bore holes in accordance with fig. 3.2.3-2.
- Plug in the dowels and screw the stand on tightly. We recommend the composite anchor.
- For earthing connect the socket head screw (of the stand) with the grounding cable (≥ 4 mm^2).
- Screw the supporting arms (fig. 3.2.3-4) to the stand (screws: M8x70). Set up with the largest possible distance between the two supporting arms.

Fig. 3.2.3-4: Supporting arm

- Screw on each holder (fig. 3.2.3-5, pos. **1**) and counterpart (pos. **2**) to the supporting arm.

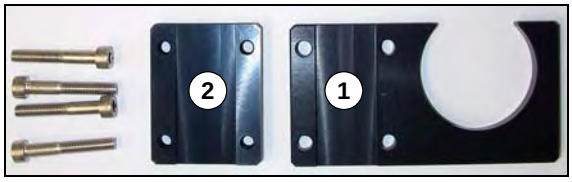

Fig. 3.2.3-5: Holder and counterpart

- Assemble the holding pipes for the Panel PC concentric to the second bore hole from top on the stand (fig. 3.2.3-3) (screws: M10x90).
- Screw the panel-PC to the outer bore holes of the holding bar (screws: M10x40).

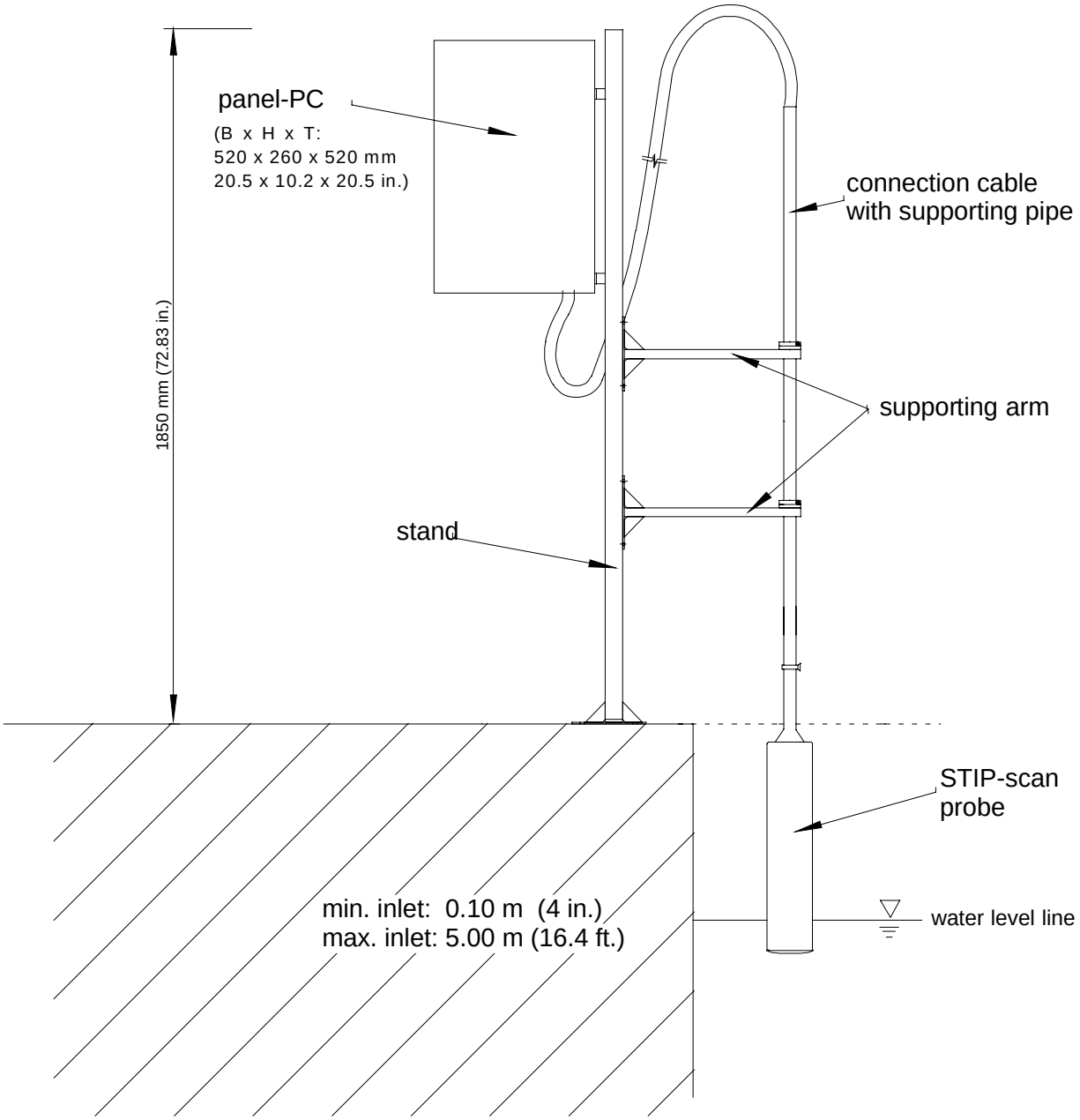

Fig. 3.2.3-6: STIP-scan at stand

3.2.4 Cable connections

DANGER

Switch on the main switch only after complete installation of all components!
There is a risk of electric shock.

3.2.4.1 Control cable connections

- Connect the seven-pin plug of the control cable to the black socket on the bottom of the protective housing (fig. 3.2.4.1-1) and tighten. Use the left plug for the first probe and the right plug for the second probe.
- Place the probe on a level surface with the aid of the carrying pipe.
- Open the clamp and remove the cap of the carrying pipe.
- Lay the sealing ring on the carrying pipe shaft so that the sealing ring edge is facing the probe.
- Place the carrying pipe on the supporting pipe, and put the ten-pin connection plug of the control cable into the socket on the carrying pipe.
- Secure it with the clamp.
- Place the probe with the supporting pipe in the maintenance position on the post.

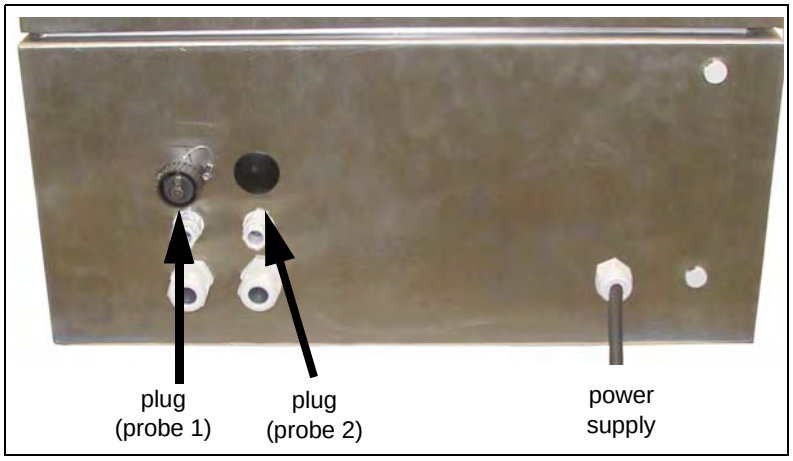

Fig. 3.2.4.1-1: Control cable connection to weather protection housing of the panel-PC

CAUTION

Heavy object! A falling probe can cause injuries. Ensure, when placing the probe in and taking it out of the measuring positions, that it is secure. Make sure that the mounting is correctly secured.

3.2.4.2 Power supply connections

- Connect the power supply cable to the power supply.

3.3 Start-up

The start-up consists of the following steps:

1. Starting the controller and the STIP-scan software: chapter 3.3.1, page 3-7
2. Controlling the internal probe pressure: chapter 3.3.6.3, page 3-42
3. Testing the spectrometer with distilled water: chapter 3.3.6.1, page 3-40
4. Entering the measuring parameters: chapter 3.3.2.3, page 3-11
5. Entering the monitoring site: chapter 3.3.2.3, page 3-11
6. Entering the name of the monitoring: chapter 3.3.5.1, page 3-26
7. Configuring analog outputs and relay contacts: chapter 3.3.5.5, page 3-30 und chapter 3.3.5.6, page 3-31
8. Configuring the COM interfaces: chapter 3.3.5.8, page 3-33
9. Calibrating the analyzer system: chapter 3.3.4, page 3-18
10. Starting the measuring operation with the calibrated analyzer system: chapter 3.3.2.1, page 3-9

The following chapter contains an explanation of all software functions in the order in which they appear in the menu.

3.3.1 Starting the panel-PC and the STIP-scan software

- Switch on the main switch.

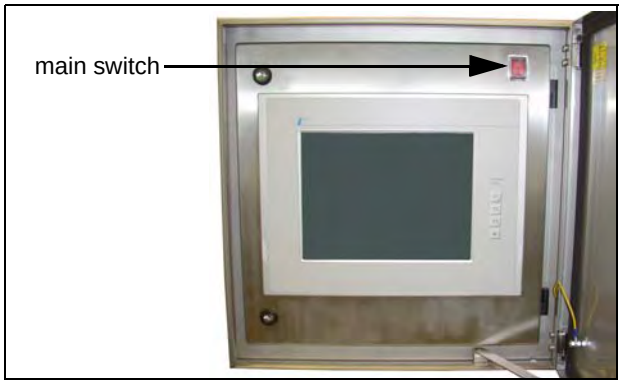

Fig. 3.3.1-1: Panel-PC in protection housing

The STIP-scan software and the keyboard software are in the autostart folder of the panel-PC. Switching on the controller automatically starts the STIP-scan software and the keyboard software.

If not located in the autostart folder, the software is started as follows:

Fig. 3.3.1-2: Link of STIP-scan software

- Double click on the "STIP-scan.exe" file symbol located on the desktop and quick-launch bar of the controller (see figure 3.3.1-2).

Fig. 3.3.1-3: Link of keyboard software

- Double click on the keyboard symbol located on the desktop of the panel PC (see figure 3.3.1-3).

- If you have a double-analyzer system, there are two links for the STIP-scan software on the desktop of the panel-PC, because each STIP-scan probe has its own software (with its own subchapters). Start both STIP-scan software programms of the double-probe system.

NOTE

If the error message “NO COM PORT AVAILABLE“ is displayed on the monitor, follow the instructions of chapter 6.3, “Possible warning and error messages” on page 6-2.

After starting the software, the following menu appears on the controller monitor:

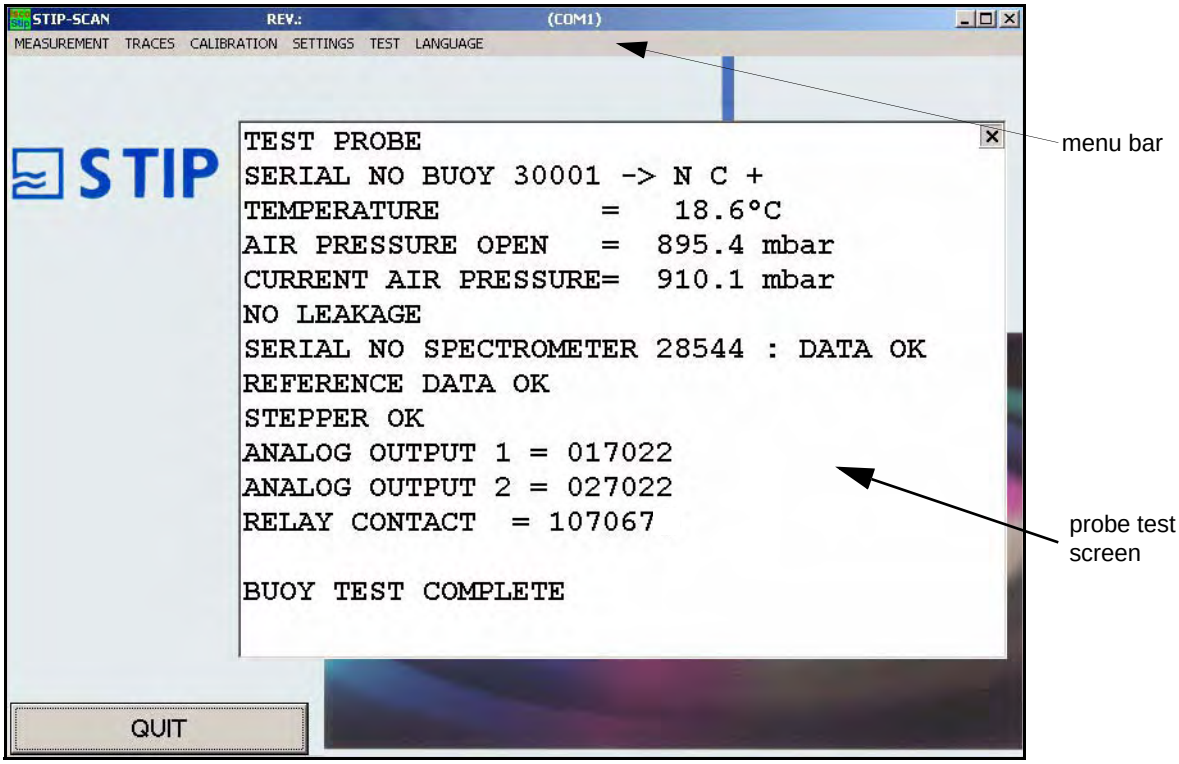

Fig. 3.3.1-4: Start of STIP-scan software

A system test is automatically carried out. More information about this test can be found in chapter 3.3.6.4, “TEST PROBE submenu” on page 3-43.

The top of the screen contains the menu bar with the software functions.
The program can be terminated by clicking on the **QUIT** button shown at the bottom left of the window.

NOTE

Before closing the STIP-scan software stop the measuring by menu **STOP MEASURING**.

- Close this screen by clicking on the ‘X’ on the right corner of the screen.

The following sections explain the items contained in the menu bar.

3.3.2 MEASUREMENT menu

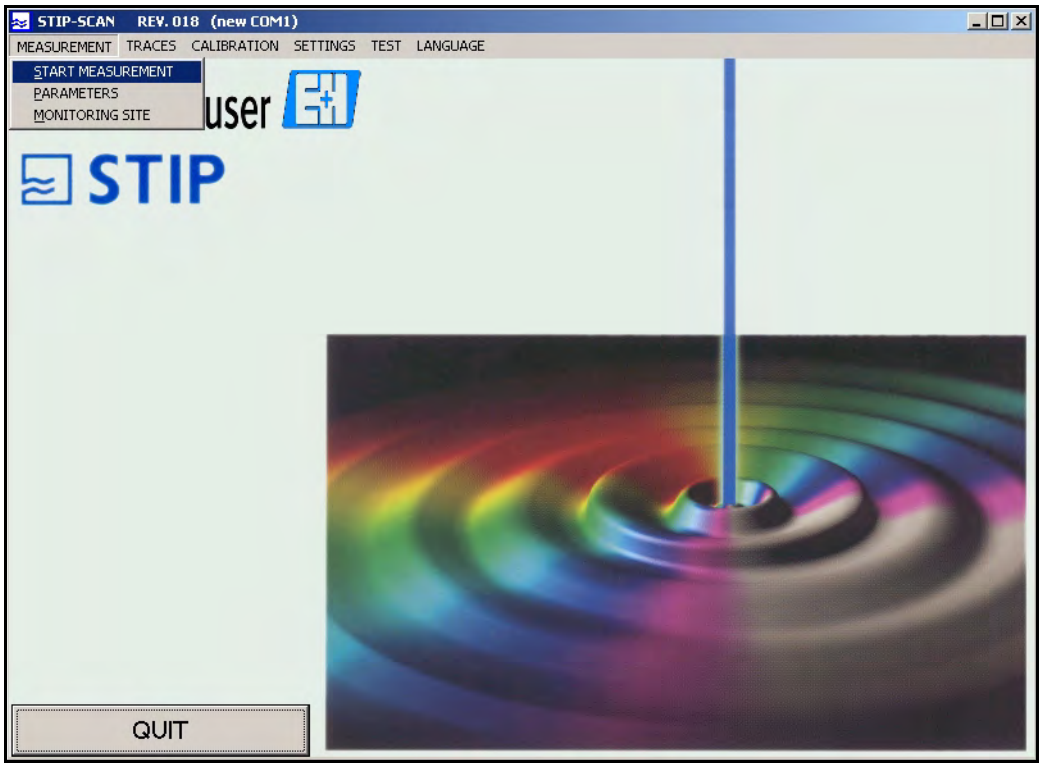

Fig. 3.3.2-1: **MEASUREMENT** menu

3.3.2.1 START MEASUREMENT submenu

Select **START MEASUREMENT** from the **MEASUREMENT** menu. The STIP-scan starts with measuring, and the message „***PROBE IN NORMAL OPERATION***“ is displayed on the main screen.
In addition to the main screen the ***TRACE*** and ***MEASURED VALUES*** screens also appear:

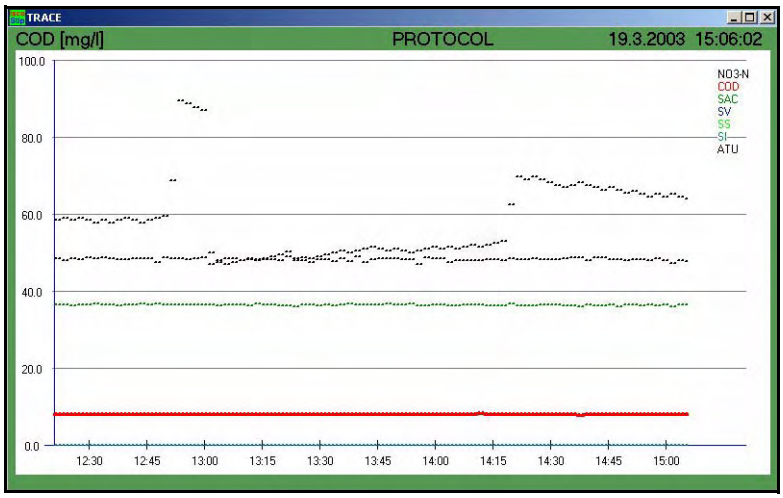

Fig. 3.3.2.1-1: ***TRACE*** screen

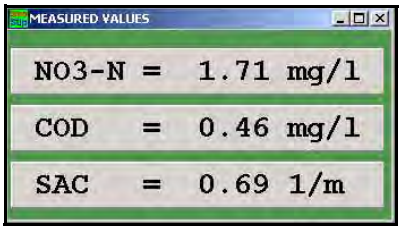

Fig. 3.3.2.1-1:
MEASURED VALUES screen

The ***TRACE*** screen shows traces of the selected parameters. The ***MEASURED VALUES*** screen displays current measured values.

For more detail regarding traces, see chapter 3.3.3, “TRACES menu” (page 3-11).

NOTE

After starting a program, "**START MEASUREMENT**" automatically changes to "**STOP MEASUREMENT**". Measuring can be terminated (without closing the program) if this menu item is selected.

NOTE

During the measuring operation, the entire **TEST** menu as well as the submenus **KHP-VALIDATION**, **NO3-VALIDATION** and **TAKE SAMPLE SPECTRUMS** are deactivated. These menus can only be activated once the measuring operation has been interrupted.

3.3.2.2 PARAMETERS submenu

In this sub-menu, you specify the parameters you wish to measure.

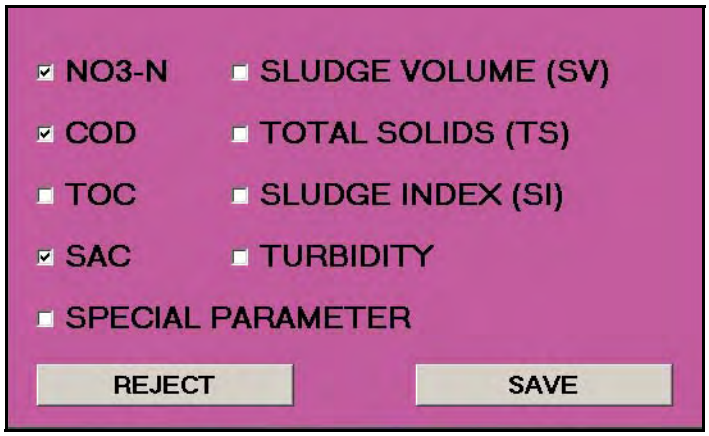

Fig. 3.3.2.2-1: **PARAMETERS** menu

- Using the left click button, select the parameters you wish to measure.

NOTE

Not all parameters can be selected at all times. Parameters that cannot be selected will appear lighter on the display than the others. Selectable parameters are dependent on the STIP-scan module (see chapter 1.2.5.1, “STIP-scan types and parameters” on page 1-14).

- Save the settings by clicking **SAVE**.
- By clicking on the **REJECT** button, your settings are erased and the system returns to the last saved settings.

3.3.2.3 MONITORING SITE submenu

Specify the monitoring site of your STIP-scan probe in this sub-menu.

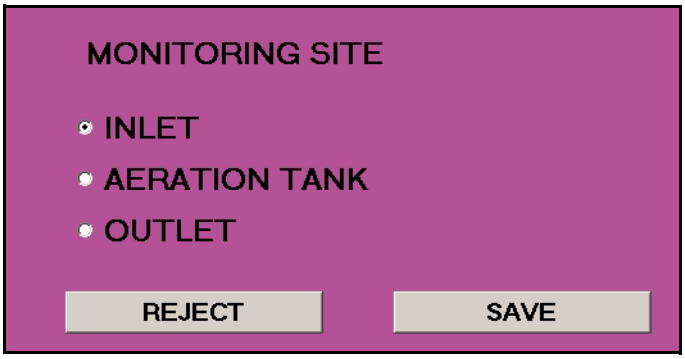

Fig. 3.3.2.3-1: **MONITORING SITE** menu

- In this menu, select the monitoring site at which the STIP-scan analyzer is installed.

NOTE

The monitoring site information is used during the plausibility check and may therefore cause incorrect results if the wrong information is provided.

- Save the settings by clicking on **SAVE**.
- By clicking on the **REJECT** button your settings are erased and the system returns to the last saved settings.

3.3.3 TRACES menu

The **TRACES** menu displays the measurements in graphical form.

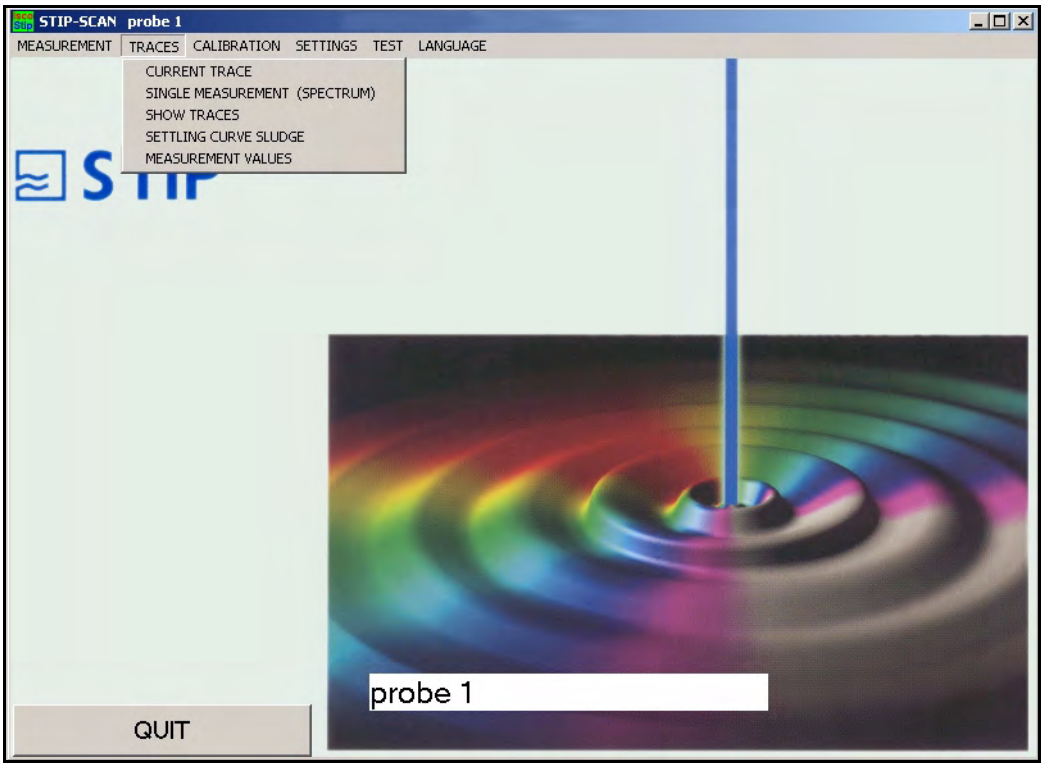

Fig. 3.3.3.3-1: **TRACES** menu

3.3.3.1 CURRENT TRACE submenu

This menu shows the current trace. When you click on the **TRACE** screen, the values of all activated parameters for a given time will be shown in a separate screen (see ⑥). Move the cursor horizontally across the screen to view progressive changes over time.

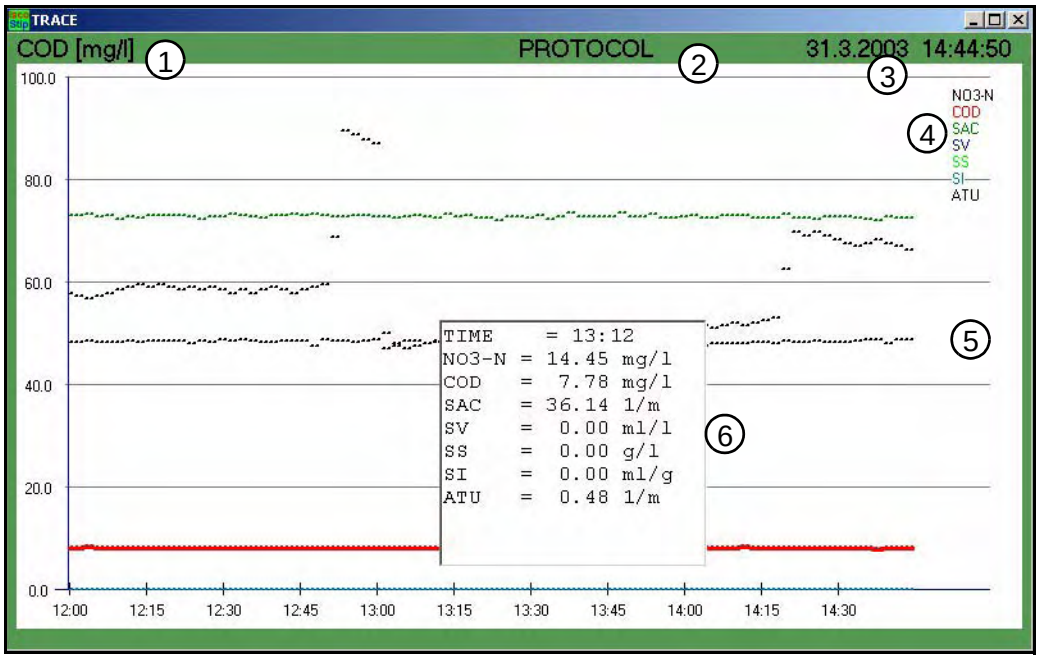

Fig. 3.3.3.1-1: **CURRENT TRACES** screen

Explanation of the CURRENT TRACES screen

① **COD [mg/l]**

The left corner of the menu bar shows the parameter whose y-axis scaling is currently active. To change the scaling, click on the parameter in the corner. The scale screen will appear. From this screen, you can select the parameter scaling to adjust in the left column, and set the scaling of the y-axis by entering the maximum values of the y-axis in the right column:

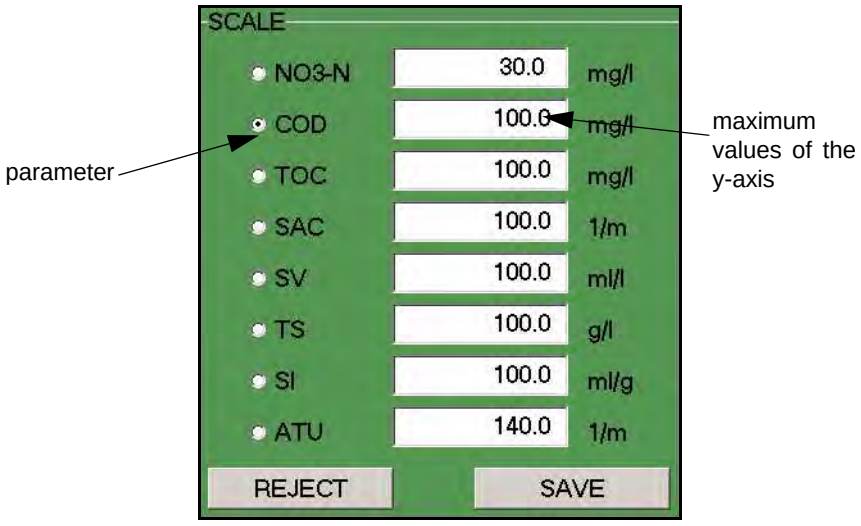

Fig. 3.3.3.1-2: ***SCALE*** screen

② **PROTOCOL**

Selection of **PROTOCOL** displays the daily report:

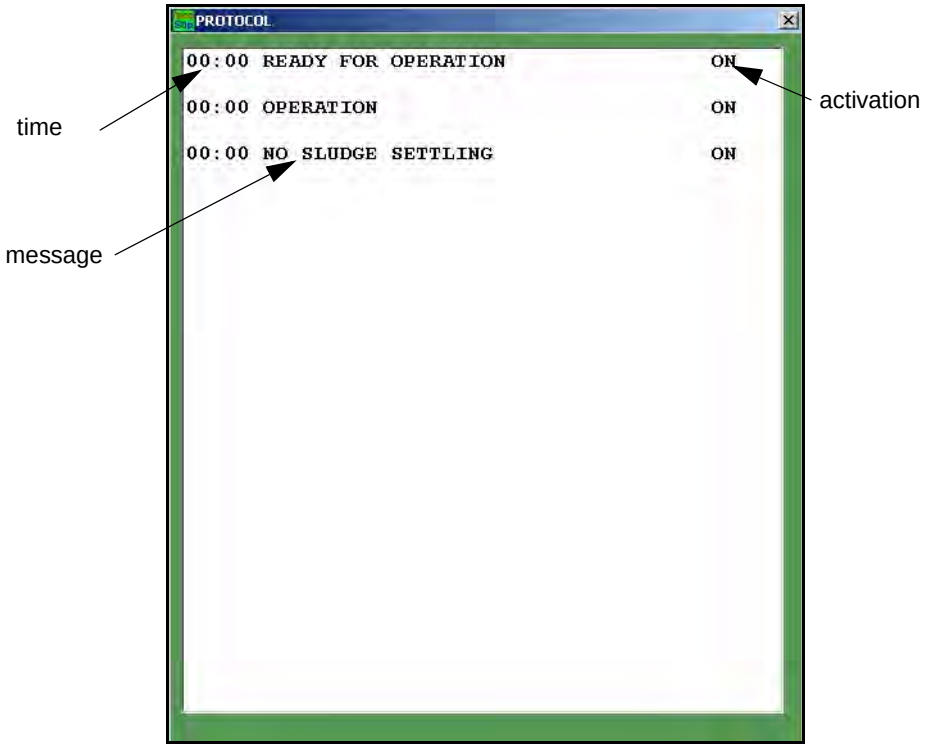

Fig. 3.3.3.1-3: ***PROTOCOL*** screen

The daily report contains the status signals of the probe, as well as warning and error messages. The time of occurrence/activation ("ON") or of the error removal/deactivation ("OFF") is listed at the start of every line.

③ **Date & time**

The date and time are shown on the right side of the menu bar.

NOTE

If the (internal PC) time does not change, this indicates that the system has crashed!

④ **NO3-N**
COD
SAC

The top right corner of the graph shows the selected measuring parameters. Each parameter has a different color to match its corresponding trace.

⑤ **Trace**

The graph shows the parameter traces according to the y-axis scaling (see ①).

⑥ **Measured values**

Moving the cursor to the traces, the time and the corresponding measured values are displayed on a separate screen.

3.3.3.2 SINGLE MEASUREMENT (SPECTRUM) submenu

This menu is only active if your system contains the "*plus*" add-on module. Depending on the wavelength, the following spectra provide the information below:

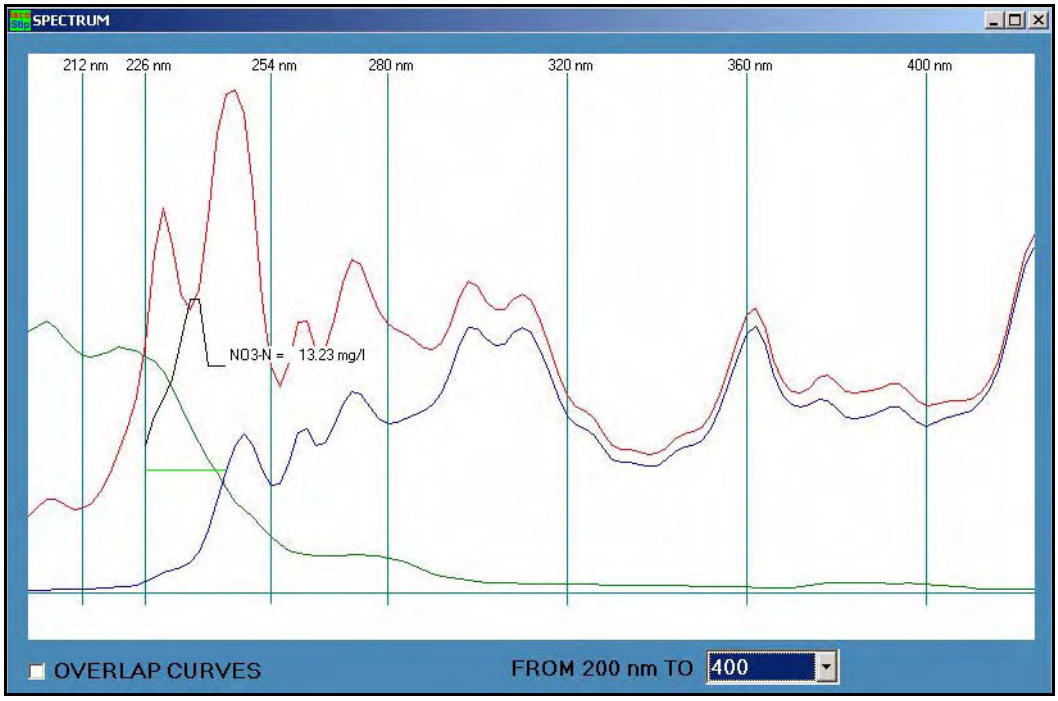

Fig. 3.3.3.2-1: ***SPECTRUM*** screen

Description of the spectra:

- red line: reference intensity with distilled water
- blue line: intensity of current measurement
- green line: measured absorbance spectrum
- black line: measured nitrate nitrogen value (NO3-N).

The following settings can be changed in the ***SPECTRUM*** screen:

1. Where several measurements are taken successively and these are to be displayed in a single diagram, the function **OVERLAP CURVES** must be activated in the bottom left corner of the ***SPECTRUM*** screen. To select this function, click on the box in front of the option. A check mark indicates activation.
2. The x-axis – i.e. the wavelength range – can be adapted to your requirements. For this purpose, the function **FROM 200 nm TO...** is used. From the drop-down menu, select the maximum wavelengths to be displayed (maximum value of x-axis). The trace is automatically displayed according to your specifications.

3.3.3.3 SHOW TRACES submenu

The **SHOW TRACES** menu allows paging through historical data:

Fig. 3.3.3.3-1: **SHOW TRACES** screen

① **COD [mg/l]**
As with the **CURRENT TRACE** screen, the left corner of the menu bar shows the parameter whose y-axis scaling is currently active.
Scaling is adjusted in the same manner (see figure 3.3.3.3-2).

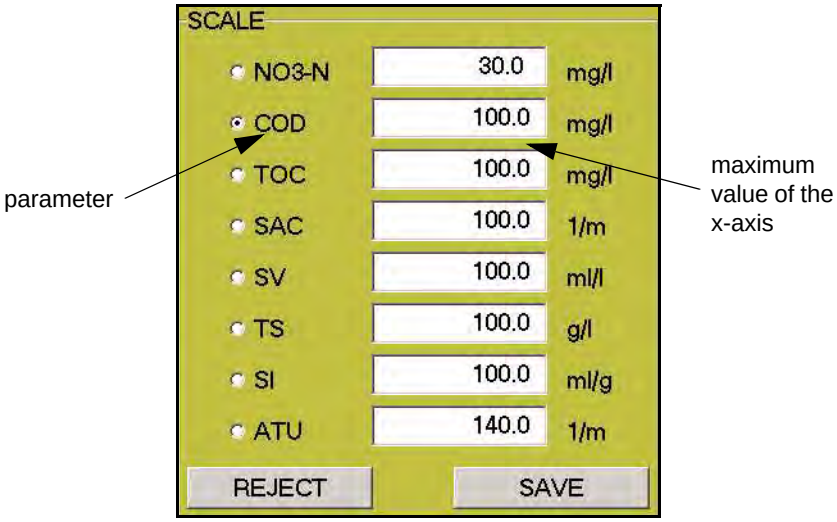

Fig. 3.3.3.3-2: ***SCALE*** screen

② **PROTOCOL**
Similar again to the CURRENT TRACE screen, the menu bar of the **SHOW TRACES** screen contains the function **PROTOCOL** for viewing daily reports.
In the **SHOW TRACES** screen, however, you can also view past reports (see **date** (⑥).

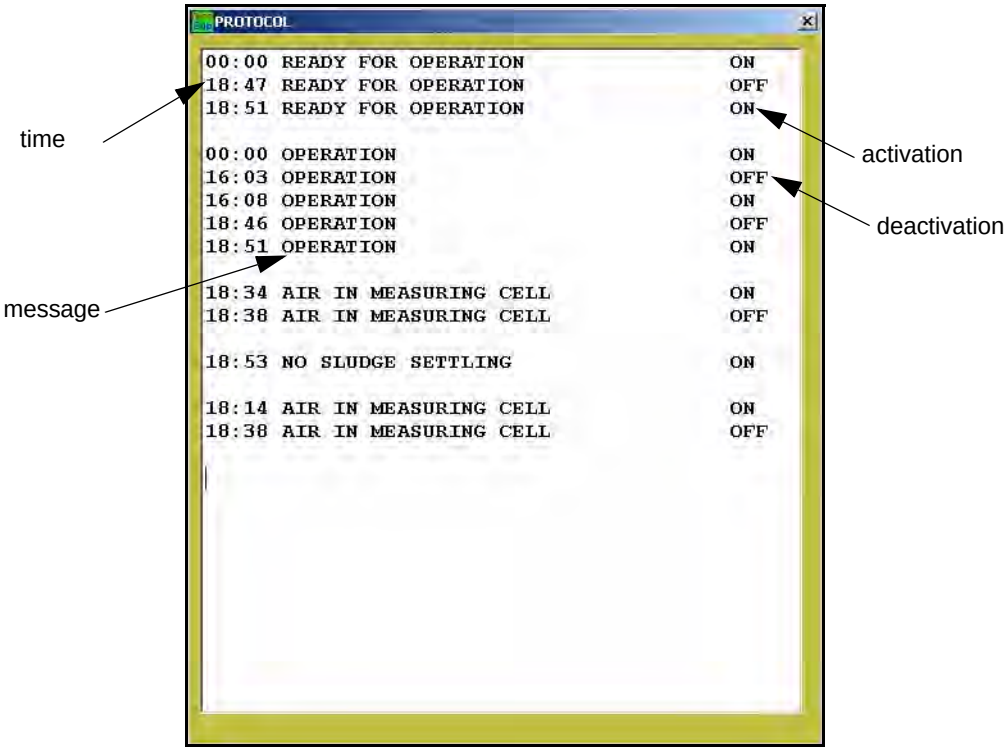

Fig. 3.3.3.3-3: ***PROTOCOL*** screen

- ③ Selected parameters, with trace-matched colors.
- ④ Traces of selected parameters.
- The **arrow keys** (⑤) can be used to page forward and backward in order to look at earlier data. Using the arrow keys also activates the time window (see ⑦ below).
- The **date display** (⑥) shows on which day the traces were recorded. To move one day forward or backward, push on the arrows to the left and right of the date.
- To view the trace(s) in closer detail, the **zoom function** can be activated. Using the mouse, move the time window to the desired time. After selecting the time window (⑦), click on the "**3 HOURS**" button (⑧). This activates the magnifying function and the graph is displayed in 3-hour segments. To return to the 24-hour view, push on the "**24 HOURS**" button in the 3-hour window.
- To save the measured data of a special day, page forward/backward with the aid to the arrow keys until accessing the desired day. Then press the „SAVE" button. The measured data of the desired day is stored as a csv-file named *YYYYMMDD.csv* (*YYYY* = year, *MM* = month, *DD* = day) in the STIP-scan folder. More details on data saving is described in section "Daily data by menu SHOW TRACES" (page 3-39).

3.3.3.4 SLUDGE SETTLING CURVE submenu

This menu shows the sludge settling curve:

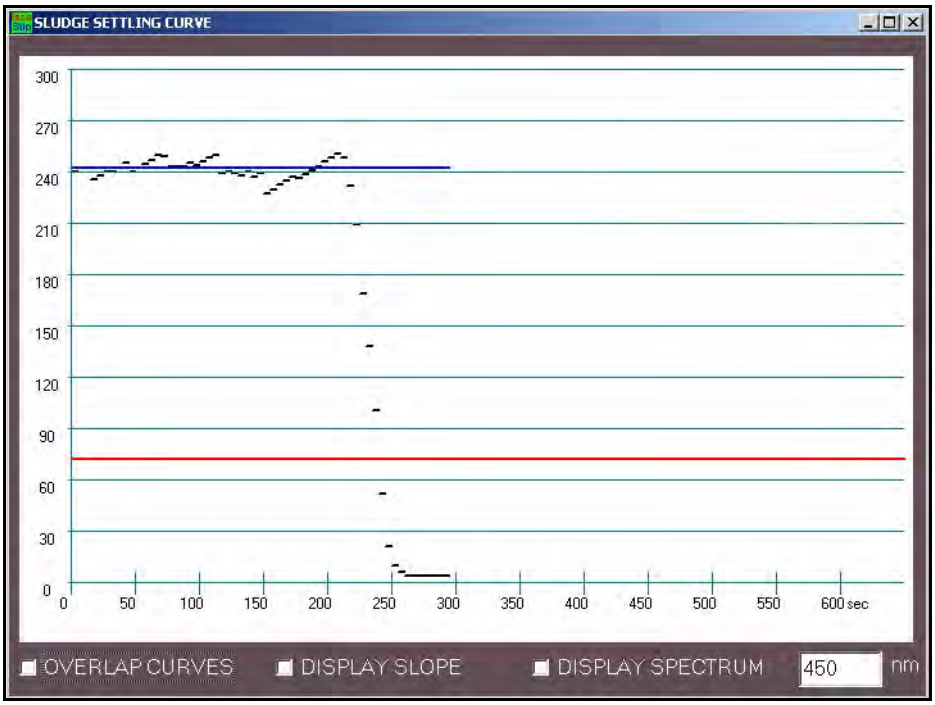

Fig. 3.3.3.4-1: **SLUDGE SETTLING CURVE** screen

The following settings can be changed in the **SLUDGE SETTLING CURVE** screen:

1. Where several measuring operations are carried out successively and the results are to be displayed in the same diagram, the function **OVERLAP CURVES** (bottom left corner), must be activated in the **SLUDGE SETTLING CURVE** screen. To select this function, click on the box in front of the option. A check mark indicates activation.
2. When the function **DISPLAY SLOPE** is selected, the slope of the settling curve is shown.
3. When the function **DISPLAY SPECTRUM** is selected, the absorbance spectrum in the **SLUDGE SETTLING CURVE** is also displayed.

NOTE

The functions **DISPLAY SLOPE** and **DISPLAY SPECTRUM** are only displayed, if your software includes the additional *"plus"* module.

3.3.4 CALIBRATION menu

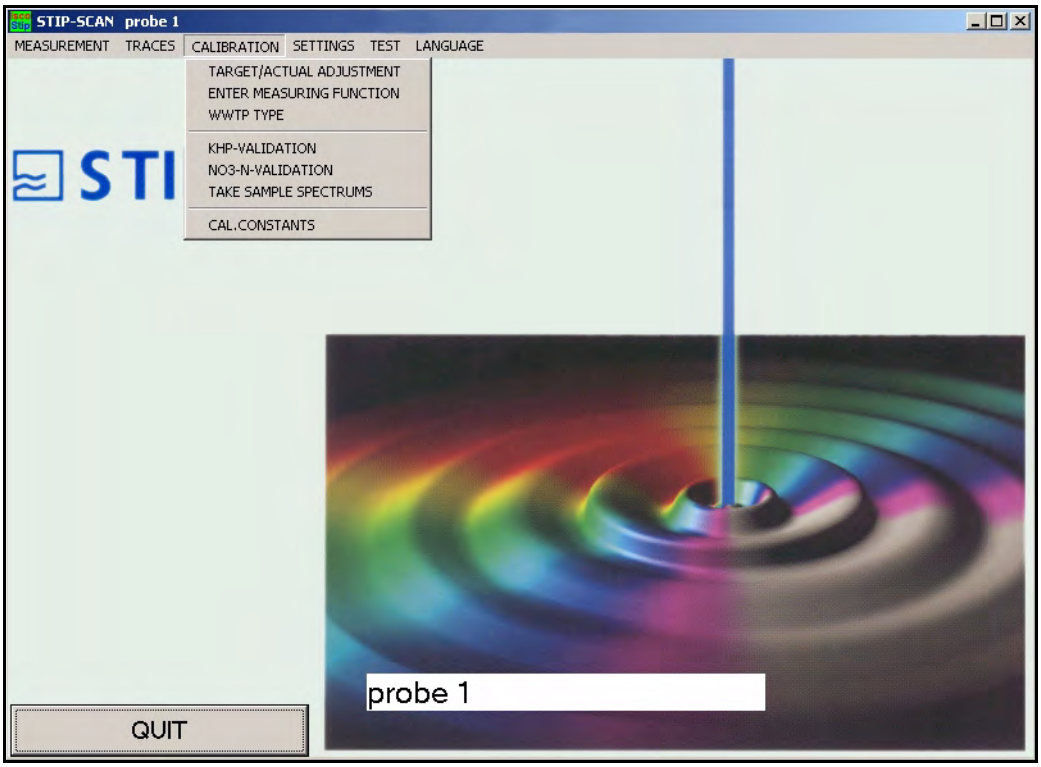

Fig. 3.3.4-1: **CALIBRATION** menu

NOTE

All **CALIBRATION** sub-menus can be protected by a user password (to activate the password, see section ”PASSWORD submenu” on page 3-32). No further reference to the input of the user password is made on the following pages.

With the aid of the **CALIBRATION** menu, the STIP-scan is individually tailored to your monitoring site conditions. As such, a calibration must be carried out for each individual parameter. The parameters SAC, SI, and ATU do not need to be calibrated.

The following section describes the calibration of NO3-N, CSB, TOC, SV, and TS. Calibration requires a suitable daily trace of the selected parameter.

NOTE

Depending on sludge characteristic, the period of observation required for determining the minimum and maximum for the calibration of the parameters SV and TS may be longer.

3.3.4.1 Preparing the calibration of NO3-N, CSB, TOC, SV, and TS

- Select and save the required parameters in submenu **MEASURMENT – PARAMETERS**.
- Select and save your monitoring site in submenu **MEASURMENT – MONITORING SITE**.
- Select and save “INDIVIDUAL“ as WWTP type in submenu **CALIBRATION – WWTP TYPE**.
- Using the **MEASURMENT – START MEASURMENT** menu, start the measuring process and let the STIP-scan run for a day (or longer - see note above).

- After 24 hours, look at the graph. The daily trace shows at what time the minimum and maximum values occurred. Enter a suitable minimum and maximum for the measured values. It is important that the difference between minimum and maximum (to be entered later at the calibration screen) is sufficiently large; the difference must be at least 30% of maximum.
- On the next day, take three samples each at the times you have recorded the minimum and maximum measured values in the daily trace.

CAUTION

To avoid injuries and infections, wear protective clothing, gloves, and goggles when working with wastewater.

At sampling time, read the values measured by the STIP-scan (STIP-scan value “HIGH“ and “LOW“). Alternately, you can record the time of manual sampling and read the measured value from the trace afterwards.

- The six samples must then undergo a suitable sample preparation. **The selection of a sample preparation for the reference measurement in the laboratory is extremely important for the individual application.** The following table shows what sample preparation has to be carried out for which parameter, and at which measuring point.

Tab. 3.3.4.1-1: Sample preparation for NO_3, CSB, and TOC

inlet	aeration tank	outlet
settling of suspended matter[a)]	filtering of suspended matter[b)]	untreated[c)]

a) according to DIN
b) using paper filter, 45 µm pore size
c) The sample does not have to be pre-treated for laboratory measuring.

- Measure the samples in the laboratory for reference. The results of the reference measurement provide the LABORATORY values for calibration.
- Once all STIP-scan values and LABORATORY values (laboratory-measured values after sample pre-treatment) have been determined, they can be used to individually adapt the parameters to the WWTP. For this operation, select **CALIBRATION – TARGET/ACTUAL ADJUSTMENT** and enter your values. Details are listed in the following section "**TARGET/ACTUAL ADJUSTMENT**".

3.3.4.2 TARGET/ACTUAL ADJUSTMENT submenu

In this sub-menu, the STIP-scan is calibrated according to the individual circumstances of your wastewater treatment plant.
For this purpose, the three measured LABORATORY and STIP-scan values in the lowest and highest measuring ranges (discussed in the previous section) are required.

Perform calibration in the following manner:

- Select the **CALIBRATION – TARGET/ACTUAL ADJUSTMENT** submenu and select the desired parameter (in example: NO3-N).
- Then, enter the value of the parameter measured by the STIP-scan, at the time of sampling, as the STIP-scan value for the low measuring range ("**LOW**" line): (1) (see fig. 3.3.4.2-1 on page 3-20).
  (unit of measure for nitrate, COD, and TOC: mg/l.; for TS: g/l; for SV: ml/l)
  example: see next page

example: The STIP-scan value of NO3-N in the lower measuring range is 1.0 mg/l.l.

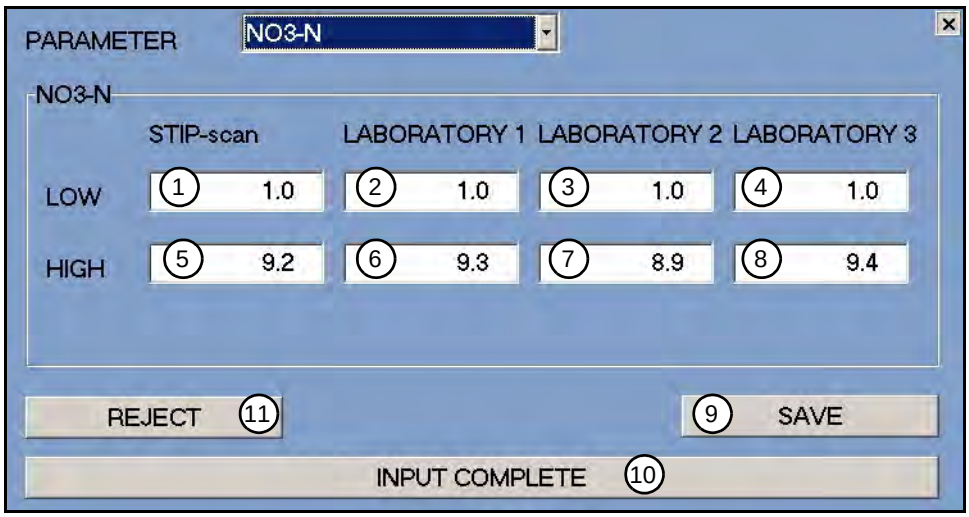

Fig. 3.3.4.2-1: Nitrate-calibration (i.e.)

- Enter the three comparison/calibration values of the laboratory-measured parameter as the LABORATORY value for the low measuring range ("**LOW**" line): (2) - (4).The unit of measure for nitrate, COD, and TOD is mg/l; g/l for Total Solids; ml/l for sludge volume.
  example : The LABORATORY values for NO3-N in the low measuring range were all 1.0 mg/l.
- For STIP-scan value for the high measuring range ("**HIGH**" line), enter the value of the parameter measured by the STIP-scan at the time of sampling ((5)).

  example: The STIP-scan value of NO3-N in the high measuring range was 9.2 mg/l.
- As LABORATORY values for the high measuring range ("**HIGH**" line), enter the three comparison/calibration values of the laboratory measurement: (6) - (8).

  example: The LABORATORY values for NO3-N in the high measuring range were 9.3 mg/l, 8.9 mg/l and 9.4 mg/l.
- After the STIP-scan and LABORATORY values are entered, they are activated by clicking "**SAVE**" ((9)).

The average is automatically calculated from the entered LABORATORY values. Next, the STIP-scan values are used to carry out a calibration for the respective parameters. This is apparent from the display of the calibration constants **a** (slope of calibration trace) and **b** (y-axis section of calibration trace) in the calibration screen:

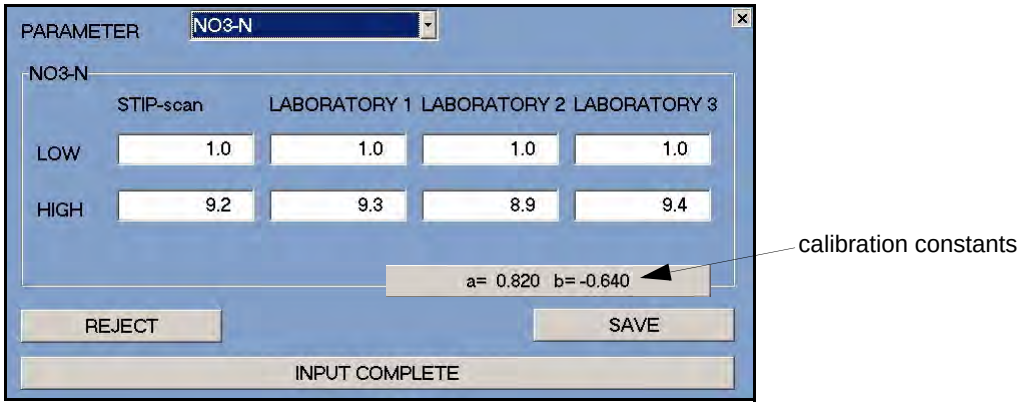

Fig. 3.3.4.2-2: Display of calibration constants

After implementation of the target/actual adaptation, the STIP-scan analyzer is calibrated.

3.3.4.3 ENTER MEASURING FUNCTION submenu

In the submenu **ENTER MEASURING FUNCTION**, individual measurements, together with measured STIP-scan values, can be evaluated as a calibration function. An extensive evaluation of the calibration function is carried out by Endress+Hauser Conducta GmbH&Co.KG Division STIP. For evaluation, a list of the collated comparison parameters with the respective date and time, as well as the STIP-scan measuring data saved in the computer, is required. After evaluation of the data, Endress+Hauser Conducta GmbH&Co.KG Division STIP will provide you with the determined calibration function, adapted specifically to your installation.

The determined calibration function must be entered into the **CALIBRATION – ENTER MEASURING FUNCTION** screen, and the calibration must be activated.

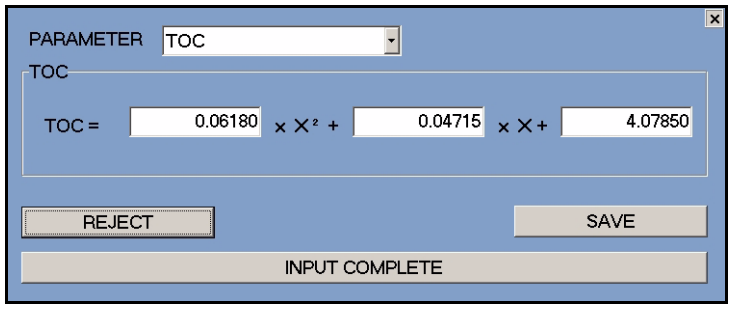

Fig. 3.3.4.3-1: **ENTER MEASURING FUNCTION** menu (here: TOC)

- To recalibrate a parameter previously calibrated, go first into the **SETTINGS – WWTP TYPE** screen (see page 3-22). Select the parameter, type "***INDIVIDUAL***", and save. This deletes the previous calibration values.

NOTE

Failure to delete the previous calibration data by saving the type as "**INDIVIDUAL**" in the **WWTP TYPE** menu will result in the re-calibration NOT being activated! Although new calibration data are displayed on screen, they are NOT activated in the system.

- Then, select the **ENTER MEASURING FUNCTION** menu and select the parameter you wish to enter. The following can be selected: NO3-N, COD, TOC, SV, and TS.
  example: A measuring function is to be entered for the parameter TOC. The parameter "**TOC**" must thus be selected.
- Enter the measuring function or the constant of the square measuring function:
  $y = a\,x^2 + b\,x + c$.
  example: In this case, a = 0.0618, b = 0.04715 and c = 4.0785.

Please note that any interference with the parameter measurement directly affects the results. Measurement should therefore only be implemented by specially trained and instructed personnel.

INFORMATION

The operator shall have the sole responsibility for changing or entering the mathematical function of the measuring traces. Endress+Hauser Conducta GmbH&Co.KG Division STIP shall not accept any responsibility for incorrect input or its consequences.

NOTE

If you want to make a TARGET/ACTUAL adjustment for the same parameter you calibrated before, go into the **SETTINGS – WWTP TYPE** screen (see next page). Select the correct parameter, type "**INDIVIDUAL**", and save. This deletes the previous calibration values. Then, you can make the TARGET/ACTUAL adjustment according to the explanation on page 3-19.

3.3.4.4 WWTP TYPE submenu

In this menu, the wastewater treatment plant type (WWTP type) must be specified for each parameter. **This setting is used for the calibration of the system and therefore MUST be entered correctly.**

Fig. 3.3.4.4-1: **WWTP TYPE** menu

Select the WWTP type for each parameter:

1. Selection of parameter (1): NO3-N, COD, TOC, SV, or TS;
2. Selection of WWTP type (2): At present, only the setting *INDIVIDUAL* can be selected.
3. Save the entered values by clicking on the **SAVE** (3) button.

After selecting a WWTP type, continue with **TARGET/ACTUAL ADJUSTMENT** menu (page 3-19) or **ENTER MEASURING FUNCTION** menu (page 3-21).

NOTE

Select the WWTP type “INDIVIDUAL“ and save it before starting a new calibration! This must be done for each parameter that shall be newly calibrated!

3.3.4.5 KHP-VALIDATION submenu

With the aid of this menu, the STIP-scan analyzer can be checked for carbon parameters, using a KHP standard solution. A KHP solution with a concentration of 50 mg/l KHP is required.

Proceed as follows:

1. Start validation by selecting **CALIBRATION**, then activating the **KHP-VALIDATION** menu.
   → The settling/measuring cell is emptied.
2. After the quartz cell has been emptied, you are prompted to place the probe in the KHP solution.
   - Thoroughly clean the outside of the probe.
   - Place the STIP-scan probe in the KHP solution.
   - Click “OK”.

   → The settling/measuring cell is rinsed three times in KHP solution before reference measurement.

At the end of the measuring operation, the KHP measuring value determined by the system is displayed.

NOTE

if your system contains the "*plus*" add-on module, the KHP validation spectrum is shown in a seperat screen. The spectrum of the KHP validation measurement is saved in file in the hard disk folder C: \ STIP-scan \ AKT_SPEK.KHP.

The measured value of the probe may deviate by up to 10% from the TARGET value of the KHP solution (50 mg/l).

NOTE

In case of larger deviations, contact the technical service of Endress+Hauser Conducta GmbH&Co.KG Division STIP.

3.3.4.6 NO3-N-VALIDATION submenu

With the aid of this menu, the total system can be checked for nitrogen parameters, using a NO_3 standard solution. A NO_3 solution with a concentration of 10 mg/l NO_3-N is required.

To perform NO_3 validation, proceed as follows:

1. Start validation by activating the **NO3-N-VALIDATION** menu.
   → The quartz cell is emptied.
2. After the settling/measuring cell has been emptied, you are requested to place the probe in the NO_3-N solution.
   - Remove the STIP-scan probe from the wastewater.
   - Thoroughly clean the outside of the probe.
   - Place the STIP-scan probe in the NO_3-N solution.
   - Confirm that the probe is in NO_3-N solution.
     → The quartz cell is rinsed three times in NO_3-N solution before reference measuring is commenced.

At the end of the measuring operation, the NO_3-N value determined by the system is displayed: figure 3.3.4.6-1

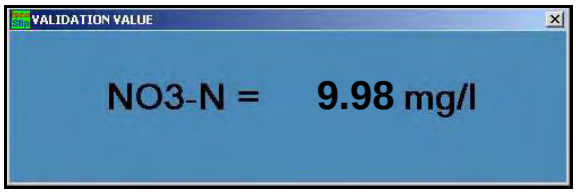

Fig. 3.3.4.6-1: **NO3-N-VALIDATION VALUE** screen

NOTE

if your system contains the "*plus*" add-on module, the KHP validation spectrum is shown in a seperat screen. The spectrum of the NO3-N validation measurement is saved in file in the hard disk folder C: \ STIP-scan \ AKT_SPEK.NO3.

The measured value of the probe may deviate by up to 10% from the TARGET value of the NO_3-N solution (10 mg/l).

NOTE

In case of larger deviations, contact the technical service of Endress+Hauser Conducta GmbH&Co.KG Division STIP.

3.3.4.7 TAKE SAMPLE SPECTRUM submenu

NOTE

The menu **TAKE SAMPLE SPECTRUM** is only available with the add-on module "*plus*".

This menu allows absorbance measurement over an entire spectrum within a specified range of your choice. The data can then be analyzed for the concentration of specific substances.

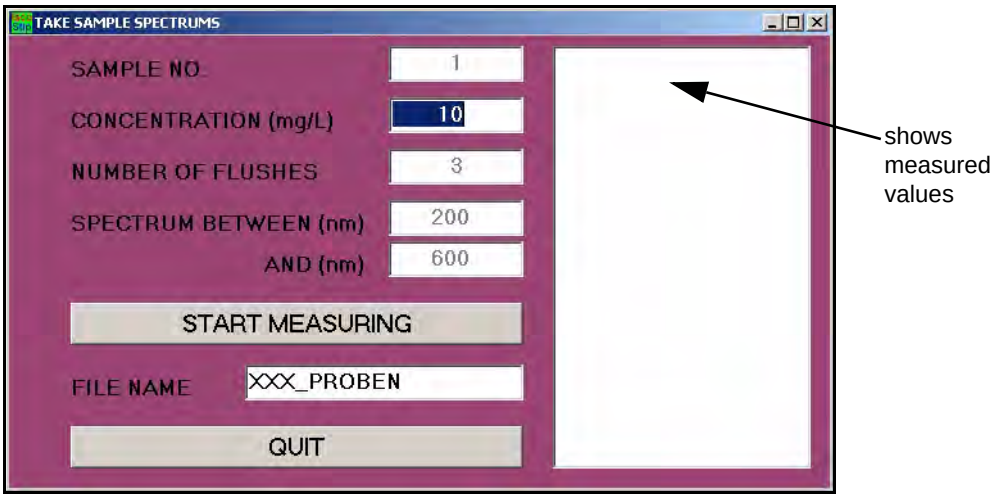

Fig. 3.3.4.7-1: **TAKE SAMPLE SPECTRUMS** menu

Input the following:

SAMPLE NO.	Enter the number of your sample.
CONCENTRATION (mg/l)	Enter the concentration in mg/l.
NUMBER OF FLUSHES	Enter the number of flushes to be carried out prior to measuring.
SPECTRUM BETWEEN (nm)	Enter bottom wavelength limit for absorbance measurement.
AND (nm)	Enter top wavelength limit for absorbance measurement.
FILE NAME	Specify the file name under which the measured values are saved.

Using the **START MEASURING** button, start the process by flushing the measuring cell (at **NUMBER OF FLUSHES** > 0). The result is displayed in the right window or in the opening trace screen.

In addition, the measured absorbance and intensity values of the sample are each stored in an Excel file. The Excel files are located in the same folder as the STIP-scan software. The measured absorbance values of the sample are stored under the chosen name with the extension "p_a". The measured intensity value of the sample is saved under the chosen name with the extension "p_i". For analysis, the data is then sent to Endress+Hauser Conducta GmbH&Co.KG Division STIP, where algorithms can be adapted for your specific application.

3.3.4.8 CAL.CONSTANTS submenu

The submenu **CAL.CONSTANTS** shows the calibration constants of all parameters that can be calibrated. The first line of each parameter shows the calibration function of the **TARGET/ ACTUAL ADJUSTMENT**. The second line of each parameter shows the calibration function of **ENTER MEASUREMENT FUNCTION**.

example 1: **CAL.CONSTANTS** screen, if the analyzer system wasn't calibrated:

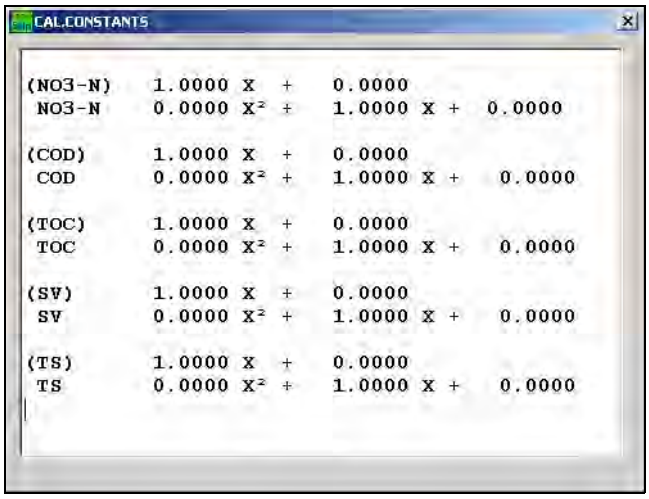

Fig. 3.3.4.8-1: **CAL.CONSTANTS** submenu (here: without any calibration)

example 2: **CAL.CONSTANTS** screen, after calibrating the parameter TOC by the **ENTER MEASURMENT FUNCTION** menu:

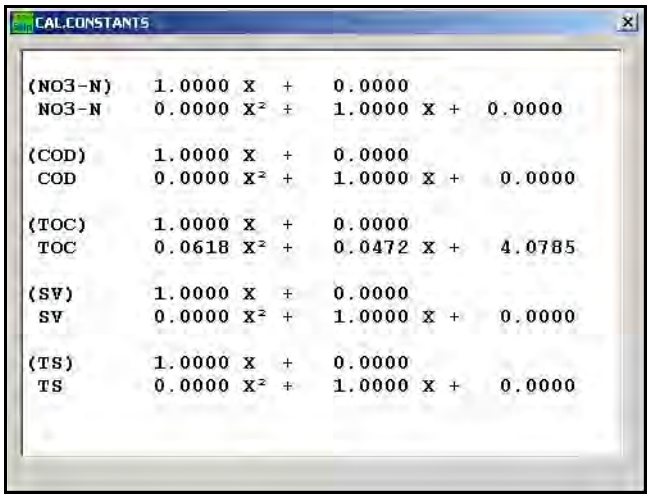

Fig. 3.3.4.8-2: **CAL.CONSTANTS** submenu (here: with calibration constants)

3.3.5 SETTINGS menu

The **SETTINGS** menu contains the settings of the monitoring site, smoothing, signal outputs, interfaces, and additional outputs.

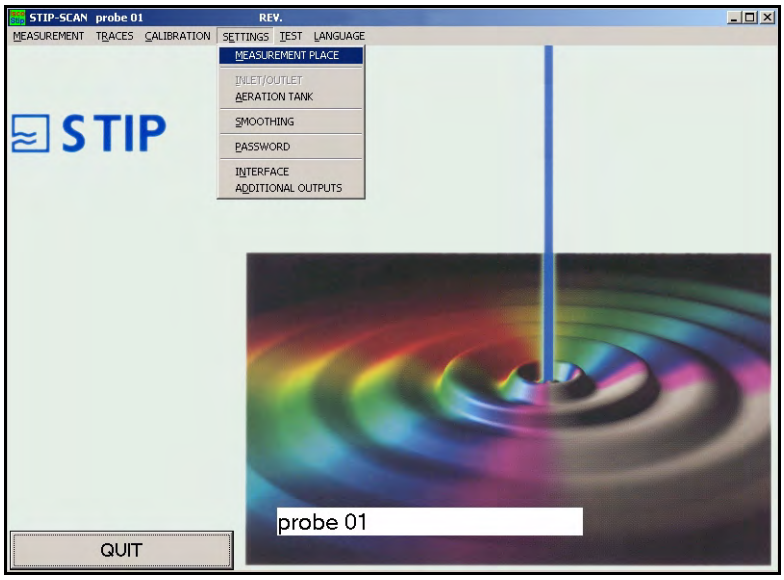

Fig. 3.3.5-1: **SETTINGS** menu

NOTE

With the exception of the **PASSWORD** menu, all sub-menus of **SETTINGS** can be protected with a user password (for activated password function, see section ”PASSWORD submenu” on page 3-32).

3.3.5.1 MEASUREMENT PLACE submenu

The measurement place menu is used for entering a description/name of the monitoring point or of the probe. A description/name makes it easier to identify a probe of a multiple-probe system (several probes connected at one controller).
Enter the description/name of the monitoring point or of the probe into the **MEASURMENT PLACE** menu. After entering, the name/description is displayed in the title bars and in the main screen of the software program

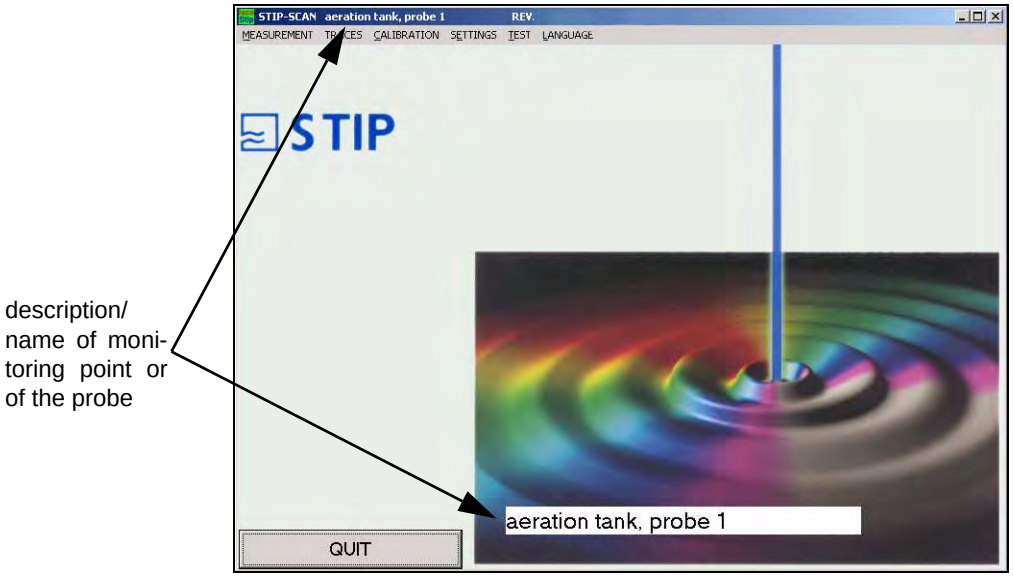

Fig. 3.3.5.1-1: Screen after entering the description/name of the monitoring point or of the probe

3.3.5.2 INLET/OUTLET submenu

NOTE

The settings in this menu should generally only be carried out by a service technician of Endress+Hauser Conducta GmbH&Co.KG Division STIP. Changes to the settings have a direct effect on the entire system and thus on the measured values.

The **INLET/OUTLET** menu can only be used if the STIP-scan is installed in the inlet or outlet of your wastewater treatment plant. If the aeration tank is your measuring point, you have to open the submenu ”AERATION TANK submenu” on page 3-28.

In the **INLET/OUTLET** menu, the program settings are entered:

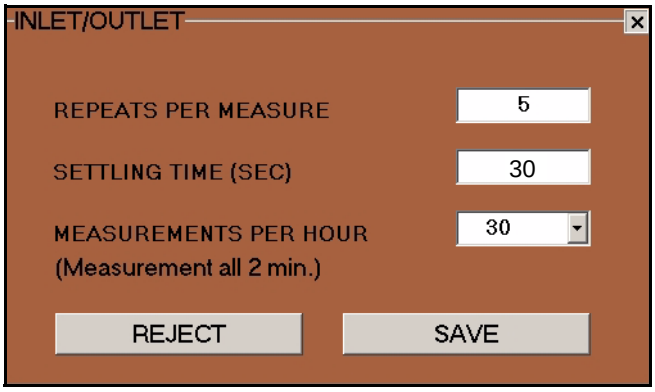

Fig. 3.3.5.2-1: **INLET/OUTLET** menu

Tab. 3.3.5.2-1: Parameter of **INLET/OUTLET** menu

parameter	description
REPEATS PER MEASURE	number of repeat measurements used to obtain an average, which becomes the measured value
SETTLING TIME (SEC) (just for inlet	time in seconds in which the suspended matter can settle; measurement only begins after expiration of the settling time. **recommendation for inlet: 30 seconds**
MEASUREMENTS PER HOUR (measurement all x min.)	number of measuring cycles per hour; is automatically converted into number of measuring cycles per minute.

- Implement your settings.
- Save your entries.
- Use the **REJECT** button to delete the entries and return to the last saved settings.

3.3.5.3 AERATION TANK submenu

NOTE

The settings in this menu should generally only be carried out by a service technician of Endress+Hauser Conducta GmbH&Co.KG Division STIP. Changes to the settings have a direct effect on the entire system and thus on the measured values.

The **AERATION TANK** menu can only be used if the STIP-scan is installed in the aeration tank of your wastewater treatment plant. If the monitoring site is located in the inlet or outlet of the waste-water treatment plant, you have to open the sub-menu ”INLET/OUTLET submenu” on page 3-27.

In the **AERATION TANK** menu, the program settings are entered:

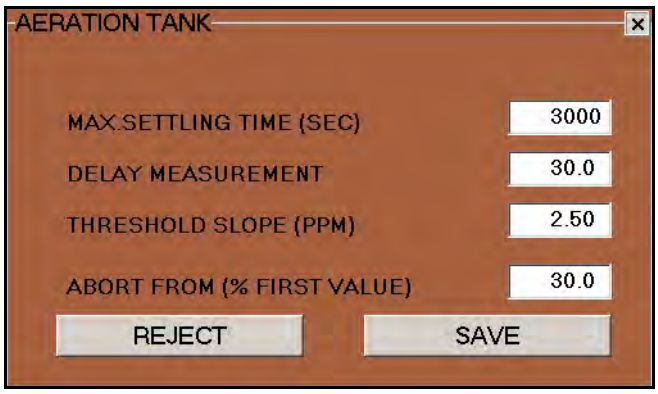

Fig. 3.3.5.3-1: **AERATION TANK** menu

Tab. 3.3.5.3-1: Parameter of **AERATION TANK** menu

parameter	description
MAX. SETTLING TIME (SEC)	max. time for settling the sludge; if the time is exceeded, the warning "**NO SLUDGE SETTLING“** is triggered.
DELAY MEASUREMENT	time in seconds before measurement starts; measurement only begins after expiration of the delay time.
THRESHOLD SLOPE (PPM)	threshold of sludge settling curve slope; Attaining this threshold finishes the reading of the sludge settling curve and starts the reading of the other measuring parameter after the settling time (standard: 30 sec.; otherwise according to parameter **SETTLING TIME** of menu **INLET/OUTLET**).
ABORT FROM (% FIRST VALUE)	value in percent of the first value at which the observation of sludge settling is interrupted and the inquiry of **THRESHOLD SLOPE** (see above) is started.

- Implement your settings.
- Save your entries.
- Use the **REJECT** button to delete the entries and return to the last saved settings.

3.3.5.4 SMOOTHING submenu

In this menu, the smoothing of the traces can be set:

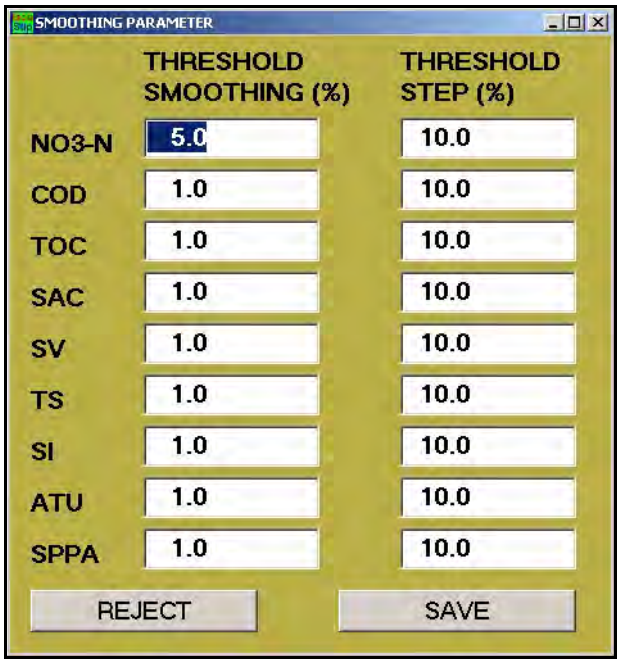

Fig. 3.3.5.4-1: **SMOOTHING** screen

Every trace can be individually smoothed. Consequently, all parameters are listed on the left side. Please note that only the selected parameters are active. The abbreviation "SPPA" stands for "special parameter".

The following smoothing settings can be used:

THRESHOLD SMOOTHING (%)	states at what % of change in the measured value a smoothing of the trace is to be activated
THRESHOLD STEP (%)	states at what % of change in the measured value, for three measurements running, a jump/step in the trace is displayed

Example: For parameter NO3-N, the following smoothing function applies – according to the above figure:

- As soon as a change of ≥5% can be observed between two NO3-N measured values, the trace is smoothed (threshold smoothing (%) ≥5.0)
- As soon as a change of ≥10% can be observed for three NO3-N consecutive readings, a jump/step appears in the trace.

After the settings have been selected, they can be saved. By clicking on the **REJECT** button, all settings are deleted and the last saved settings are activated.

3.3.5.5 ANALOG OUTPUTS submenu

Depending on the application, your STIP-scan contains one or two analog output modules, i.e. two to four current interfaces. These can be configured in the **ANALOG OUTPUT** menu.

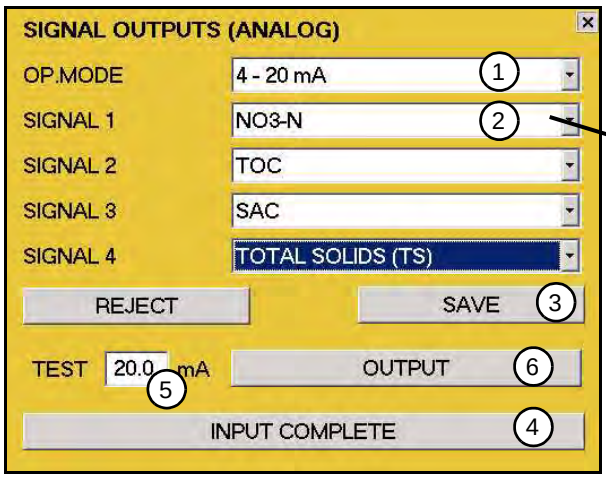

Fig. 3.3.5.5-1: **ANALOG OUTPUT** menu

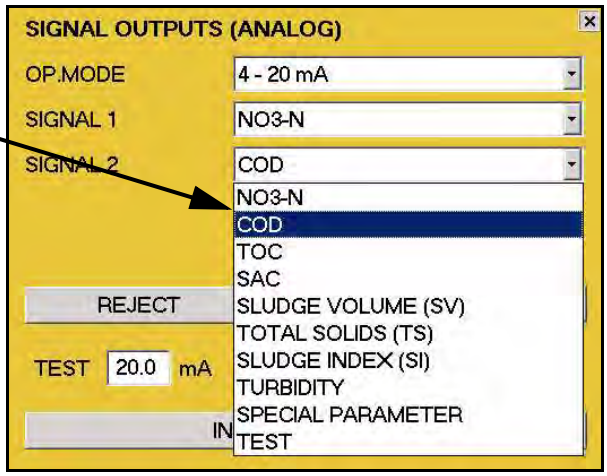

Fig. 3.3.5.5-1: Choice list

Tab. 3.3.5.5-1: Parameter of **ANALOG OUTPUTS** menu

parameter	description
OP.MODE (1)	determination of the operating mode of the output module **options: 0 - 20 mA** and **4 - 20 mA**
SIGNAL 1 (2...4) (2)	determination of which signal output should be selected at which parameter **options:** see figure 3.3.5.5-1 Only select the "**TEST**" parameter, if you want to carry out a functional test of the module. The "**TEST**" parameter may only be selected for a signal output ("**SIGNAL**").

- Enter the settings.
  If you have one analog module, only two signal outputs ("**SIGNAL 1**" and "**SIGNAL 2**") will be displayed.
- Save your entries with the **SAVE** key (3).
- Use **REJECT** to delete the settings and return to the last saved settings.
- Close the menu/window by clicking on the **INPUT COMPLETE** button (4).

Functional test of output modules

For this operation, an ammeter is required. We recommend stopping the measuring mode for testing the output modules.
The function of the analog output modules can be checked by selecting the "**TEST**" parameter for the signal output to be tested and entering a current under the **TEST** item (5). The signal output (test function) should then be activated by clicking on the **OUTPUT** (6) button. Using the ammeter, check whether the entered test current is applied during activation of the test function.

3.3.5.6 RELAY CONTACTS submenu

Seven relay contacts are available. These can be configured in the **RELAY CONTACTS** menu.

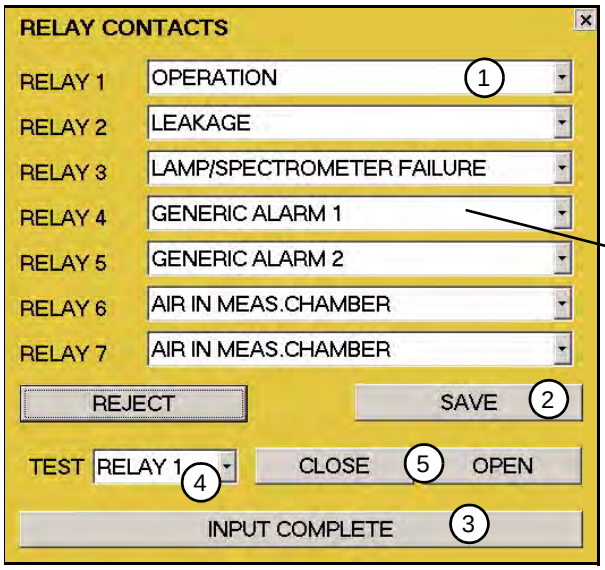

Fig. 3.3.5.6-1: **RELAY CONTACTS** menu

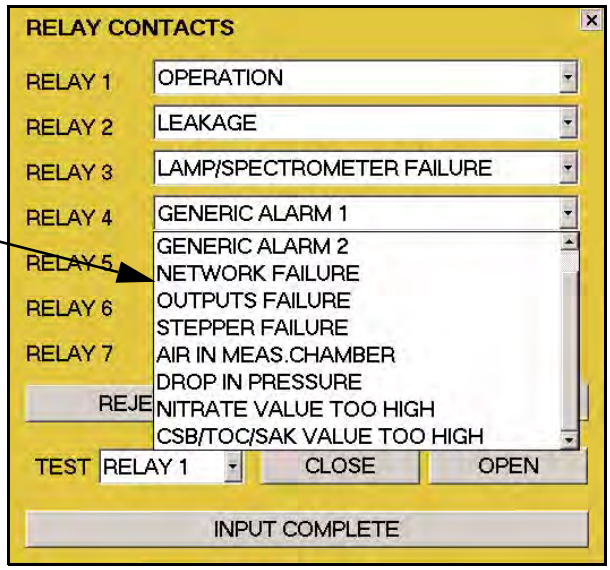

Fig. 3.3.5.6-1: Choice list

- Specify which signals/data you wish to output to which **RELAY:** (1).
  The following should be observed:
  - The output of **RELAY 1** will always be **OPERATION**.
  - The output of **RELAY 2** will always be **LEAKAGE**.
  - The output for **RELAY 3** will always be **LAMP/SPECTROMETER FAILURE**")
  - **RELAY 4** to **RELAY 7** can be individually assigned. The following selection options are available (figure 3.3.5.6-1):

GENERIC ALARM 1	The relay opens if one of the following errors occures: **LEAKAGE**, **NO LIGHT SIGNAL**, **NETWORK ERROR**, **OUTPUTS FAILURE** (warning & error), **STEPPER FAILURE**, **AIR IN MEASURING CELL** (just error), **DROP IN PRESSURE**, **NO VALID REFERENCE**; for more details see chapter 6, “Troubleshooting”
GENERIC ALARM 2	The relay opens if one of the following warnings occures: **NO SLUDGE SETTLING**, **ABSORPTION TOO HIGH**, **NITRATE VALUE TOO HIGH**, **AIR IN MEASURING CELL**; for more details see chapter 6, “Troubleshooting”
NETWORK FAILURE	The relay opens if the communication between the panel-PC and the probe is interrupted.
OUTPUTS FAILURE	The relay opens if the data output via the analog outputs or the signal output via the relay contacts does not function correctly.
STEPPER FAILURE	The relay opens in case of a functional stepper failure.
AIR IN MEAS.CHAMBER	The relay opens if air is detected in the measuring cell.
DROP IN PRESSURE	The relay opens if the pressure drop inside the probe is too high.
NITRATE VALUE TOO HIGH	The relay opens if the measuring range for nitrate is exceeded during operation.

COD/TOC/SAC VALUE TOO HIGH The relay opens if the measuring range for COD, TOC, or SAC is exceeded during operation.

- Save your entries by clicking on **SAVE** (2).
- Use **REJECT** to delete the settings and return to the last saved settings.
- Close the menu/window by clicking on the **INPUT COMPLETE** button (4).

Functional test of relays

A continuity tester is required for testing the function of the relays.
To check the function of the relays, select the relay contact to be checked from the **TEST** menu (4). Next, open or close the relay by clicking on **OPEN** or **CLOSE** (6). Using the continuity tester, the opening and closing of the relay can be checked.

3.3.5.7 PASSWORD submenu

In order to prevent unauthorized access, the software program contains a password function. This function prevents unauthorized access to the analyzer by requesting an additional password before allowing access to the **CALIBRATION** and **SETTINGS** menus. In order to select the **CALIBRATION** and **SETTINGS** menus, a password is required after activating the password function.

INFORMATION

Once activated (see below), the password function cannot be deactivated again! The password function can only be deactivated by a service technician of Endress+Hauser Conducta GmbH&Co.KG Division STIP. This is done to prevent unauthorized deactivation of the password function.

Only persons that know the user password can select the **CALIBRATION** and **SETTINGS** menus if the password function has been activated.

Activating the password function

If you decide to use the password-protection function, this can be activated as follows:

- Select the **PASSWORD** menu:
- To activate the password function, the manufacturer's password must first be entered. This password is enclosed in the packaging of the equipment. Confirm the password by clicking **ENTER**.
- Now enter the new password and confirm the password by pressing **ENTER**.
- Enter the new password a second time and confirm it by clicking **ENTER**.

NOTE

Pass on the user password to all persons who should have access to the **CALIBRATION** and **SETTINGS** menus.

→ The password function has now been activated, a red dot appears in the left top corner of the main screen:

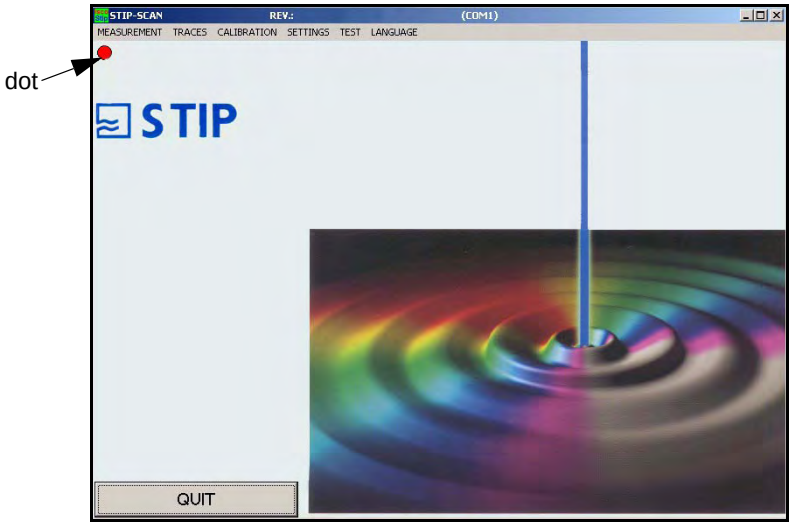

Fig. 3.3.5.7-1: Activated password function

Once the correct password has been entered, the dot will disappear.

De-activating the user password

Only the service technician of Endress+Hauser Conducta GmbH&Co.KG Division STIP can disable the password function.

3.3.5.8 INTERFACE submenu

From the **INTERFACE** menu, the panel-PC interface is selected, that should be used for the communication with the STIP-scan probe.

- Select the interface COM1 for the first STIP-scan probe and activate your selection by clicking on **OK**.
- Select the interface COM2 for the second STIP-scan probe and activate your selection by clicking on **OK**.

Activating a new COM interface, the message "**new COM**" is displayed on the menu bar.

In normal operation mode, the communication between converter module and panel-PC is continually checked. If a free COM interface isn't found for 5 times (per day) during a measuring, the error message "**NETWORK FAILURE**" is activated at the 6th time (per day). if the communication between probe and panel-PC is interrupted/deactivated while activating a manual function (e.g. starting the STIP-scan software, calibration etc.), the error message "NO COM PORT AVAILABLE" is activated. Further details on error messages and their remedial action are in chapter 6, "Troubleshooting" .

NOTE

if the error message „"NO COM PORT AVAILABLE" is displayed during the STIP-scan software start, check, if you chose the correct COM interface in menu INTERFACE. The COM interface selected in menu INTERFACE must be identical with the panel-PC interface at which the RS232-cable of the corresponding probe is connected with the panel-PC.

3.3.5.9 ADDITIONAL OUTPUTS submenu

In this menu, the following additional features can be activated:

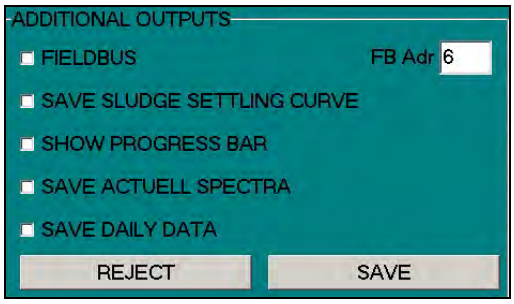

Fig. 3.3.5.9-1: **ADDTIONAL OUTPUTS** memu

Tab. 3.3.5.9-1: Parameter of **ADDITIONAL OUTPUTS** menu

parameter	description
FIELDBUS	activates or deactivates the Fieldbus connection; Details on the Field connection are on page 3-35.
FB Adr	Fieldbus address; Details on the Field connection are on page 3-35.
SAVE SLUDGE SETTLING CURVE	activates/deactivates the saving of the sludge data into a csv-file; More details on sludge data storage are on page 3-38.
SHOW PROGRESS BAR	activates/deactivates the process bars „**NEXT MEASURENT**“, „**SLUDGE SETTLING TIME**“ and „**SETTLING TIME**“ in the main screen; More details on page 3-38.
SAVE ACTUELL SPECTRA	activates/deactivates the saving of the spectra into a csv-file; More details on page 3-39.
SAVE DAILY DATA	activates/deactivates the saving of the measured data (without sludge data) of a whole day into a csv-file. More details on page 3-39.

Optionale Fieldbus connection

The Fieldbus connects the STIP-scan analyzer with other external measuring and controlling instruments. Each component is placed in the field as wanted and is controlled by one point.
The STIP-scan analyzer system needs an additional plug-in Fieldbus card and must be connected to a Fieldbus system. A Profibus (process Fieldbus) with the protocols DPV1 or DPV0 is used for the Fieldbus communication with the STIP-scan.

Minimum requirements on Profibus connection to STIP-scan analyzer system

- The panel-PC must equipped with the additional plug-in Fieldbus card. Technical data of the plug-in card are listed on page 1-20. The Fieldbus plug-in card is installed into the panel-PC exclusively by Endress+Hauser Conducta GmbH&Co.KG Division STIP!
- Every Profibus DRV1 or DPV0 compartible instrument (e.g. Siemens S5 or S7 programmable logic controller) can be used as a master.

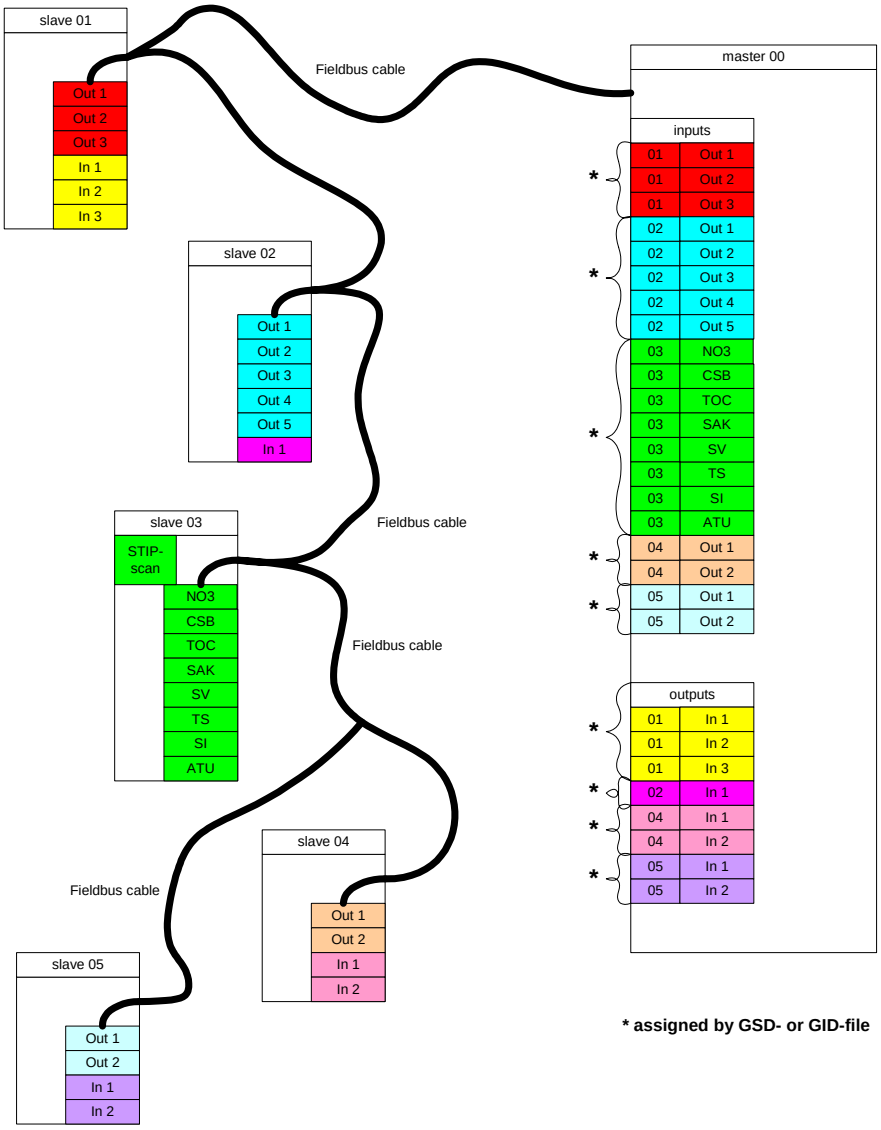

Fig. 3.3.5.9-2: Fieldbus connection diagramm

Installation of the Profibus connection

- ”Step 1: Installation of Profibus connection with the PLC” on page 3-35
- ”Step 2: Installation of Fieldbus in the STIP-scan software” on page 3-37
- ”Step 3: Check the Fieldbus installation” on page 3-37

Step 1: Installation of Profibus connection with the PLC

- **Define the Fieldbus address**
  For installation of a Fieldbus connection with a PLC (programmable logic controller), the address must be defined under which the Fieldbus card (slave) can be controlled by the PLC (master). The standard setting of the Fieldbus address for the STIP-scan is „6“.

- **Define the transmitted data format**
  The master (PLC) must be informed which kind of information can be understand by the Fieldbus card. Thereby you must take into account which kind of information the master (PLC) can be handle. Because the „simple“ PLC like Siemens S5 can’t handle the same information like an „advanced“ PLC (e.g. Siemens S7), the data transfer of the „simple“ and the „advanced“ PLC must be differed:

"Advanced" PLC (e.g. Siemens S7)
An „advanced“ PLC can handle floating points numbers. So the type of the measured STIP-scan data can be transferred directly to the „advanced“ PLC.

"Simple" PLC (e.g. Siemens S5)
A „simple“ PLC can’t undterstand floating points numbers. The „simple“ PLC needs integer numbers. (The values range of this data format is from -32768 up to 32767 for numbers with algebraic sign or from 0 up to 65535 without algebraic sign.)
Because the measured data of the STIP-scan are floating points numbers, the measured data must be multiplied with suitable factors to get integer numbers for the processing by a „simple“ PLC. The factors for the multiplication are:

Tab. 3.3.5.9-2: Multiplication factors

parameter	factor
NO3-N	100
COD	10
TOC	10
SAC	100
SV	100
TS	10
SI	100
ATU	100
SP1	10

1st example: Nitrate
The nitrate value measured by the STIP-can is multiplicated with the factor 100 and then transferred to the PLC (S5). So, the measured value of 12.34 mg/l is transferred as the number „1234“ to the PLC (S5).

2nd example: COD
Because the COD measured value can be very high and the second decimal place is uninteresting, the COD measured value is multiplicated with the factor 10 and then transferred to the PLC (S5). So, the measured value of 736.48 mg/l is transferred as the number „7364“ to the PLC (S5).

NOTE

If you change from the „simple“ PLC to a „advanced“ PLC, special settings of the STIP-scan software must be changed! Contact a service technician of Endress+Hauser Conducta GmbH&Co.KG Divison STIP *before* changing!

- **Define the format of the data to be transferred**
  The PLC must be informed how the data of the Fieldbus card (slave) are saved so that the I/O memory of the slave (Fieldbus card) is correctly copied into the PLC. The schematic in fig. 3.3.5.9-2, page 3-35 shows the Fieldbus connection of the STIP-scan analyzer system.

  "Advanced" PLC (e.g. Siemens S7)
  At an „advanced“ PLC, a correct copy of the I/O memory of the slave (Fieldbus card) is saved into the GSD-file (historical data of the device).

  "Simple" PLC (e.g. Siemens S5)
  At a „simple“ PLC a correct copy of the I/O memory of the slave (Fieldbus card) is saved into GID files which must be implemented into a „simple“ PLC and compiled before. (The GID files are usually burned on an EPROM and plugged in the PLC.)

Step 2: Installation of Fieldbus in the STIP-scan software

- Switch on the panel-PC by the main switch (see chapter 3.3.1, page 3-7).
- If the STIP-scan software automatically starts, quit the STIP-scan software by the button **QUIT** in the main screen.
- Open the file „Daten.stp“ by the editor. The file „Daten.stp“ is located in the same folder like the STIP-scan software on the hard disk of the panel-PC.
  At the end of the list the section "[FELDBUS]" is listed. Enter the number „1“ into the line „FBTyp = ...“ for the Fieldbus type S7 or the number „2“ for Fieldbus type S5. Pay attention to the blanks in front of and following the „=“ sign! Save your entry and lose the file „Daten.stp“.
- Start the STIP-scan and the keyboard software (see chapter 3.3.1, page 3-7).
- Switch into menu **SETTINGS – ADDITIONAL OUTPUTS** und activate the **FIELDBUS** function. Enter the desired Fieldbus address into the field **FB Adr** (default setting : **FB Adr** „**6**“, chapter 3.3.5.9, page 3-34).
- Save all entries by pressing the button **SAVE**.

Step 3: Check the Fieldbus installation

After successful installation of the Fieldbus, the main menu of the STIP-scan program shows a green dot with a „F" inside the dot (see figure 3.3.5.9-3).
If there is a red dot instead of a green one, the Fieldbus card can’t be initialized or there’s no communication to the PLC (master) possible.
If there is no dot shown on the main menu, the panel-PC probably does not have any Fieldbus card.

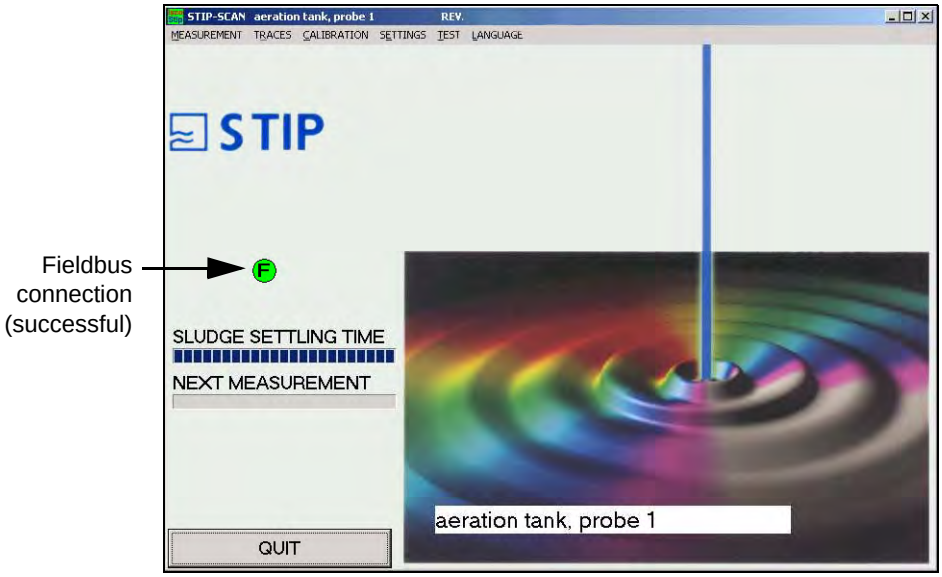

Fig. 3.3.5.9-3: Successful Fieldbus installation

Optional storage of sludge data

If the option **SAVE SLUDGE SETTLING CURVE** is activated in menu **SETTINGS – ADDITIONAL OUTPUTS**, the data of the sludge settling curve (*SDA*) are saved as a csv-file on the hard disk of the panel-PC:

- **file of absorbance values of sludge measurement at time hh-mm**
  The files *SDA-hh-mm.csv* are saved with each sludge measurement at the corresponding current time *hh-mm* in the hard disk folder C: \ STIP-scan \ *SDAYYYY* \ *SDAYYYY-MM* \ *SDAYYYY-MM-DD* .
- **file of absorbance values of sludge measurement at the day YYYY-MM-DD**
  All sludge absorbance data of one day are saved in the file *SDA_ YYYY-MM-DD.csv* in hard disk folder C: \ STIP-scan \ *SDAYYYY* \ *SDAYYYY-MM* \ *SDAYYYY-MM-DD*.

  abbreviation legend
  SDA - abbreviation for sludge data
  YYYY - indication of the year, four-digit number
  MM - indication of the month, two-digit number
  DD - indication of the date, two-digit number
  hh - indication of the time; „*hh*“ is abbreviation of the hour, two-digit number
  mm - indication of the time; „*mm*“ fis abbreviation of the minute, two-digit number

Processing of the sludge data by Microsoft Excel

Csv-files can be converted into an Excel sheet and then be processed. To do this, the csv-files must be download from the hard disk of the panel-PC (via USB port of the panel-PC) and uploaded onto a PC at which the Microsoft program Excel is installed. After uploading, start the Excel program an open the csv-file via the menu **File – Open**. Thereby you must take into account that the files are lists seperated by semicolons and comma as decimal seperated.

Display of the progess bar in main menu

If the option **SHOW PROGRESS BAR** is activated in menu **SETTINGS – ADDITIONAL OUTPUTS**, the progress bar is displayed on the main menu.

There are thre kinds of the progress bar:

- The progress bar „**NEXT MEASUREMENT**“ shows the time until the next measurement starts (see fig. 3.3.5.9-4);
- The progress bar „**SLUDGE SETTLING TIME**“ showns the time for the measurement in the aeration tank until the sludge settling is completed. This process bar is only shown with activated sludge settling.
- The progress bar „**SETTLING TIME**“ (see fig. 3.3.5.9-4) shows the time for settling suspended substances in the inlet as well as the time for settling suspended solids after the sludge settling in the aeration tank:

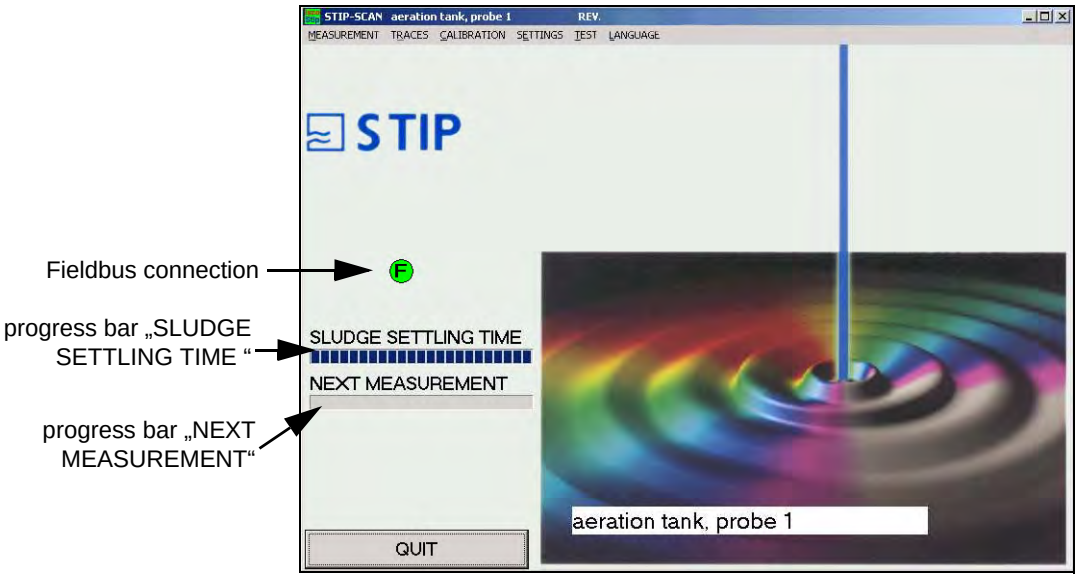

Fig. 3.3.5.9-4: Main menu with progress bar „**NEXT MEASUREMENT**", progress bar „**SLUDGE SETTLING TIME**" and activated Fieldbus connection

Storage of the actual spectrum

If the option **SAVE ACTUAL SPECTRA** is activated in menu **SETTINGS – ADDITIONAL OUTPUTS**, the spectrum of the current measurement is saved in the csv-file AKT_SPEK.MES in the hard disk C: \ STIP-scan \ *.* of the panel-PC.

Storage of the daily data

If the option **SAVE ACTUAL SPECTRA** is activated in menu **SETTINGS – ADDITIONAL OUTPUTS**, the daily data of all parameters are saved in one csv-file on a hard disk folder of the panel-PC. To do this, scroll in menu **SHOW TRACES** to the desired day and then press the button „**SAVE**". The next batch will overwrite the existing fill.

Contiuously saved daily data

The measured values of all parameters are saved in one daily data file named „*DAYYYYM-MDD.csv*". All dairly data files are in the month folder named *MDAYYYYMM* in the STIP-scan folder, hard disk drive C: \ STIP-scan \ *MDAYYYYMM* \ *DAYYYYYMMDD.csv*.

Daily data by menu SHOW TRACES

If the option **SAVE ACTUAL SPECTRA** isn't activated, you can make a daily data file with the aid of the menu SHOW TRACES: Switch to menu TRACES – SHOW TRACES and scroll to the desired day. Then press the button „SAVE".
The measured values of all parameters are saved in one daily data file named „*DAYYYYM-MDD.csv*". All dairly data files are in the month folder named *MDAYYYYMM* in STIP-scan folder hard disk drive C: \ STIP-scan \ *MDAYYYYMM* \ *DAYYYYYMMDD.csv*.

abbreviation legend
MDA - abbreviation for monthly data
YYYY - indication of the year, four-digit number
MM - indication of the month, two-digit number
DD - indication of the date, two-digit number

3.3.6 TEST menu

In the **TEST** menu, the function of the spectrometer, stepper for the piston, air pressure inside the probe, and of the entire system can be checked:

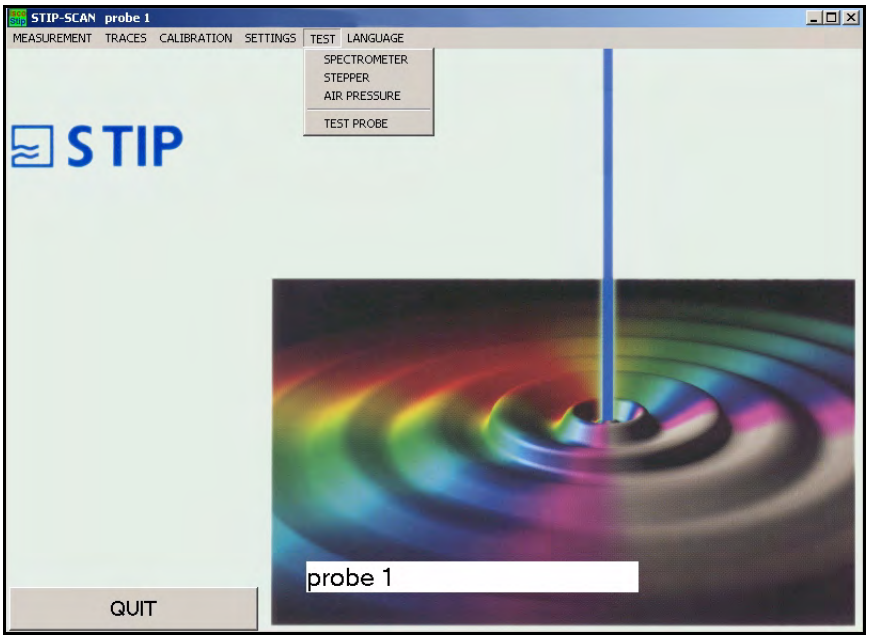

Fig. 3.3.6-1: **TEST** menu

3.3.6.1 SPECTROMETER submenu

With this menu, the function of the spectrometer can be checked.

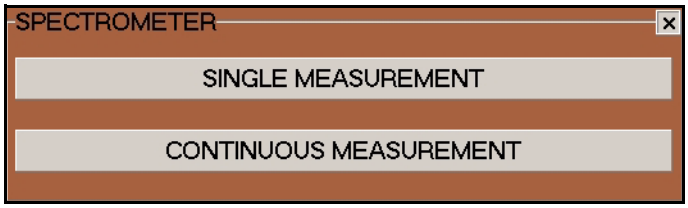

Fig. 3.3.6.1-1: Spectrometer test screen

- Clean the outside of the probe, if necessary, and put it in distilled water to check the function of the spectrometer (at initial start-up).
- Flush the quartz cell a minimum of three times by driving the stepper up and down (see next section on page 3-41).
- Go to the **TEST** menu, (sub-chapter **SPECTROMETER**) and select the **SINGLE MEASUREMENT** button to see the spectrum of the sample (distilled water). If your system contains the „*plus*“ add-on module, it automatically opens a **SPECTRUM** screen containing the traces.
- If you wish to view a continuous measurement, select the **CONTINUOUS MEASUREMENT** button. If your system contains the „*plus*“ add-on module, the **SPECTRUM** screen then automatically opens (see fig. 3.3.6.1-2 on page 3-41). If you activate the function **OVERLAP TRACES** in the **SPECTRUM** window, the progressive traces of each measurement are shown.
- While continuous measurement is active, the **CONTINUOUS MEASUREMENT** key appears in red (see fig. 3.3.6.1-2). Measurement will continue until the **CONTINUOUS MEASUREMENT** key is selected again.

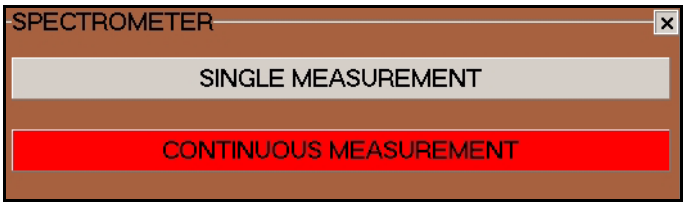

Fig. 3.3.6.1-2: Continuous measurement

3.3.6.2 STEPPER submenu

With this menu, the function of the stepper is tested.

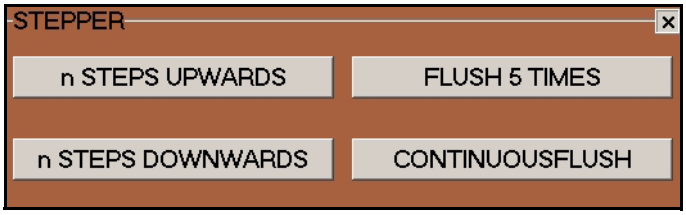

Fig. 3.3.6.2-1: **STEPPER** test menu

After activating one of the above buttons, listen for the upward or downward movement of the piston.

button	function
n STEPS UPWARDS	The piston moves completely upwards so that the quartz tube is completely filled with medium.
n STEPS DOWNWARDS	The piston moves completely downwards so that the quartz tube is completely emptied.
FLUSH 5 TIMES	The piston moves completely upwards and downwards. Use this function for cleaning and flushing the quartz tube with distilled water or other solutions.
CONTINUOUS FLUSH	The piston continuously moves upwards and downwards. The flush will continue until the button **CONTINUOUS FLUSH** is pressed again. The activation of the continuous flush is shown by a red background color.

3.3.6.3 AIR PRESSURE submenu

An additional pressure test of the STIP-scan probe must be done upon first start-up. The probe body of the STIP-scan analyzer is slightly pressurized with the air pump supplied in the accessory kit.

Pressurize the system as follows:

1. Select **AIR PRESSURE** from the **TEST** menu. The following screen appears:

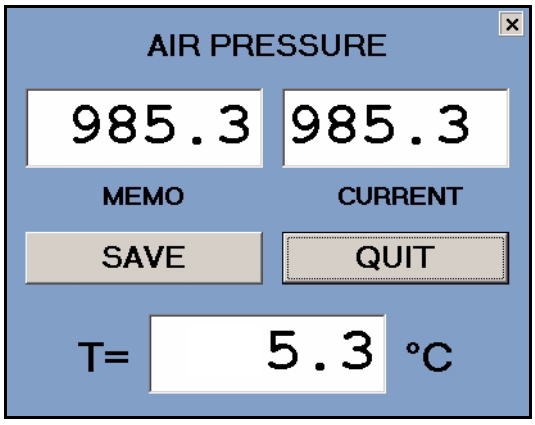

Fig. 3.3.6.3-1: Air pressure screen

2. Depressurize the STIP-scan probe and save the pressure shown in the "**CURRENT**" field by pressing the "**SAVE**" button. The current pressure is shown then in the "**MEMO**" field.
3. Close the probe and connect the connection line to the probe. Make sure that the probe is sealed.
4. Pump air into the probe to pressurize the probe the air pump supplied in the accessory kit. You can follow the increasing pressure in the "**CURRENT**" field. Keep pumping until the difference between the pressure inside the probe ("**MEMO**") and the ambient pressure ("**CURRENT**") is approx. 300 mbar.
5. Save the shown pressure ("**CURRENT**" field) so that the value is shown in the "**MEMO**" field.
6. Wait for 30 minutes. Then check if the pressure inside the probe is still constant. A maximum pressure droop of 20 mbar within 30 minutes is allowed.
7. If the proof pressure test can be performed successfully, depressurize the STIP-scan probe, save the shown pressure ("**CURRENT**" field) and restart the measurement (menu **START MEASUREMENT**).
   A pressure drop > 20 mbar may indicate a leak. Please contact your service technician of Endress+Hauser Conducta GmbH&Co.KG Division STIP.

NOTE

At each start-up of the STIP-scan software, a systems test is performed and displayed (see fig. 3.3.3.1-3, page 3-13 and fig. 3.3.6.4-1, page 3-43).

3.3.6.4 TEST PROBE submenu

At each start-up of the STIP-scan software, a system test is performed. This test checks the functionality of the entire system.

With the aid of the **TEST PROBE** menu, a system test can be manually triggered.

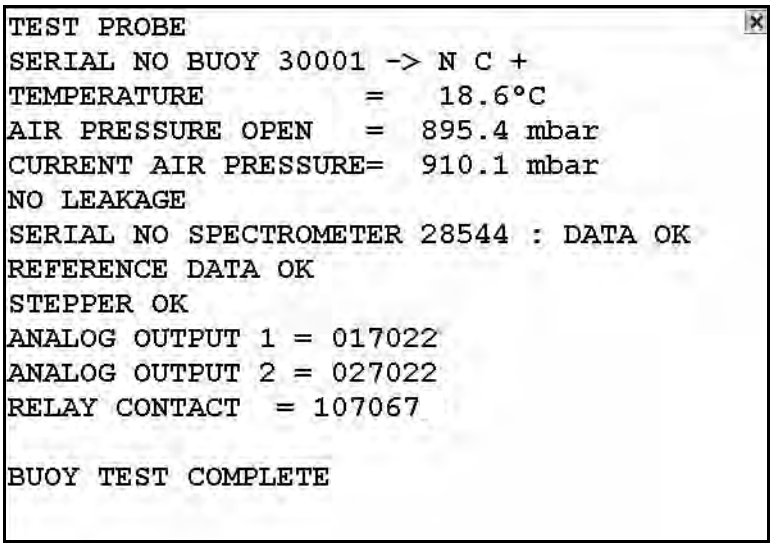

Fig. 3.3.6.4-1: **TEST PROBE** menu

The following information is displayed:

- serial number of STIP-scan and respective module type
- temperature inside the probe
- air pressure of open probe (probe is not pressurized)
- current air pressure inside the probe (after pressurization)
- signal of leakage sensor (here: **NO LEAKAGE**)
- serial number and test status of spectrometer
- test status of reference values
- function of stepper
- check of analog signal outputs (display of module series)
- check of relay contacts (display of module series)
- end of system test.

3.3.7 LANGUAGE menu

With the aid of the **LANGUAGE** menu, the language of the STIP-scan software can be changed:

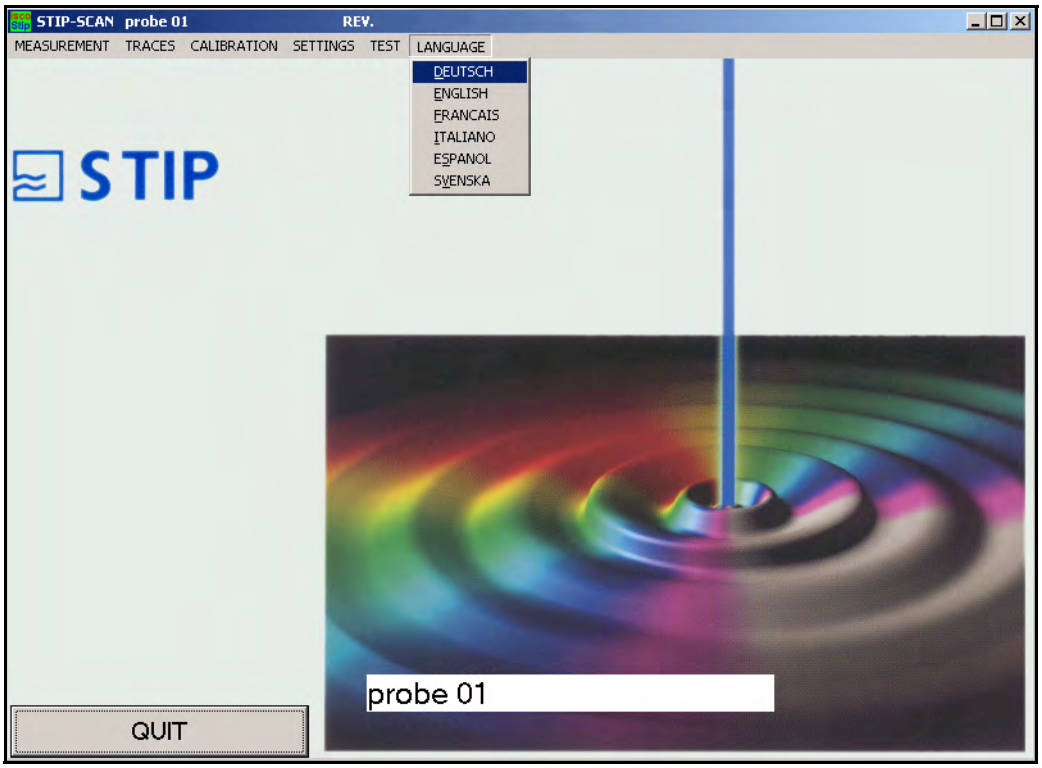

Fig. 3.3.7-1: **LANGUAGE** menu

When selecting a language that is not active (here: Deutsch/German) the software language is automatically changed to the desired language.

Example: Upon activating the Deutsch/German language, the language of the software program changes:

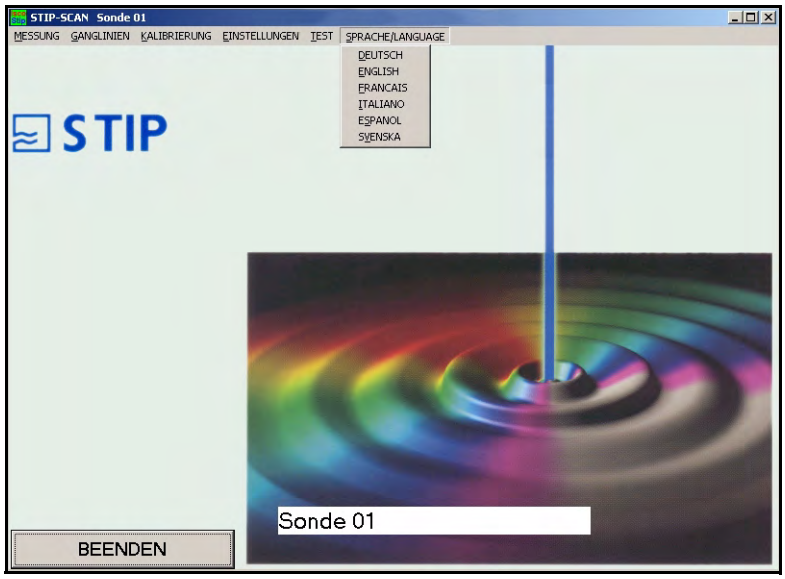

Fig. 3.3.7-2: Software in German

4 Decommissioning

In order to decommission the STIP-scan, the probe must be cleaned and the connection cable must be disconnected.

Required equipment:

- protective clothing (goggles, gloves, lab coat);
- cleaning solution, if necessary
- distilled water
- bucket with water, scouring cloth, cloth.

Six steps are required for taking the analyzer out of service:

1. Stopping the measurement (chapter 4.1)
2. Cleaning the STIP-scan probe (chapter 4.2)
3. Cleaning the quartz tube (chapter 4.3)
4. Quitting the STIP-scan software (chapter 4.4)
5. Switch-off the panel-PC and disconnection from power supply (chapter 4.5)
6. Disconnection of connection cable (chapter 4.6)

4.1 Stopping the measurement

- Go into menu **MEASURING – STOP MEASURING** and stop the measurement.
- Go into menu **TEST – STEPPER** and press the button "**n STEPS DOWNWARDS**" to completely empty the quartz tube.

NOTE

If you have a **double-analyzer system** (two STIP-scan probes connected at one panel-PC), you must also stop the measurement of the **second** STIP-scan probe: Go into menu **MEASURING – STOP MEAU-RING** of the **second** analyzer.

If you want to decommission the second STIP-scan probe, too, empty its quartz tube by pressing the button „**n STEPS DOWNWARDS**" of menu **TEST - STEPPER** of the second probe.

4.2 Cleaning the STIP-scan probe

CAUTION

Always wear protective gloves, goggles, and lab coat to prevent injuries to the skin and infections from coming into contact with waste water.

- Take the probe out of the waste water and clean dirt from the probe housing.

NOTE

For decommissioning the second STIP-scan probe, take also the second probe out of the waste water and clean the dirt from the probe housing.

4.3 Cleaning the quartz tube

- Place the probe into a bucket of distilled water.
- Go into menu **TEST – STEPPER** and press the button "**FLUSH 5 TIMES**" to flush the quartz tube with distilled water.

INFORMATION

Under special circumstances it may be necessary to flush the tube with a cleaning solution to remove adherent deposits from the quartz tube. In this case the quartz tube must be flushed with distilled water at least five times after using the cleaning solution!

For flushing go into menu **TEST – STEPPER** and press buttom "**FLUSH 5 TIMES**".

- After flushing press the button "**n STEPS DOWNWARDS**" to move the piston completely to the bottom.
- Remove the probe from bucket of distilled water.

NOTE

For decommissioning the second STIP-scan probe, clean the quartz tube of the second probe according to the instructions described above.

4.4 Quitting the STIP-scan software

- Quit the STIP-scan software by pressing the button "**QUIT**" of the STIP-scan software main window.
  The STIP-scan program will be automatically closed.

NOTE

If you have a **double-analyzer system**, you must also quit the STIP-scan software of the second probe regardless whether the second probe should be decommissioned or not.

4.5 Switch-off the panel-PC and disconnection from power supply

- From the start menu on the desktop, select „Shut Down".
- After the software has completed the shut-down process, switch off the mains switch of the panel-PC.
- Disconnect the panel-PC from power supply.

4.6 Disconnection of connection cable

- Open the clamp of the supporting pipe of the probe.
- Loosen the ten-pin plug connection between connection cable and probe and disconnect the connection cable form the probe.
- Disconnect the connection cable also from the seven-pin, black socket on the bottom of the protective housing.

NOTE

For decommissioning the second STIP-scan probe, disconnect also the connection cable of the second probe according to the instructions described above.

After disconneting the connection cable the probe is ready for storage or transport. Store the panel-PC at autorized ambient storage temperatures.

NOTE

If you have a **double-analyzer system** and you want to decommission only one STIP-scan probe, you switch-on the panel-PC after decommissioning the first STIP-scan probe. Re-start the STIP-scan software of the second probe according to chapter 3.3.1, page 3-7. Re-start the measurement of the second probe according chapter 3.3.2.1, page 3-9.

5 Maintenance and servicing

The STIP-scan analyzer is a low-maintenance and user-friendly analyzer. Performance checks and simple maintenance can be carried out on-site.

An overview about necessary periodic maintenance is shown in the following chapter.

5.1 Maintenance plan

The maintenance intervals listed in the following table are minimum intervals that Endress+Hauser Conducta GmbH&Co.KG Division STIP is recommending for standard applications. Herein a standard application is regarded as a measurement of waste water with predominant municipal parts or as installations in aeration tanks or outlet monitoring. For other applications, especially industrial waste water, shorter maintenance intervals may be required.

Tabelle 5.1-1: Maintenance plan of STIP-scan for standard applications

maintenance task	interval of maintenance by the user	interval of maintenance by factory Endress+Hauser Conducta GmbH&Co.KG Division STIP
cleaning the quartz tube with cleaning solution	_[a)]	yearly
visual check of the probe housing	monthly	yearly
visual check of the sample inlet (cleaning if necessary)	monthly	yearly
proof pressure test of the probe	monthly	yearly
exchange of seals (seals for piston, housing etc.)	–	yearly
replacement of exchange components (e.g. desiccant cartridge)	–	yearly
maintenance of optical components (repairs or exchange, if necessary)	–	yearly
check of stepper motor and guide tube	–	yearly
performance check	–	yearly

a) if necessary or recommended by Endress+Hauser Conducta GmbH&Co.KG Division STIP

5.2 Periodical performance tests by the user

The performance of the STIP-scan probe should be checked periodically[1)]. Endress+Hauser Conducta GmbH&Co.KG Division STIP recommends the following on-site activities:

- Check the probe housing (e.g for corrosion) visually; clean, if necessary (chapter 4.2, page 3-1).
- Check the sample inlet of the probe (e.g. for blockage) visually. Remove the protective flange (fig. 5.2-1) and check the sample inlet and clean, if necessary.
- Check the probe for leakage (menu **TEST – AIR PRESSURE**, see chapter 3.3.6.3, page 3-42).
- Check for warnings or error messages in the "**PROTOCOL**" window (menu **SHOW TRACES**).
  If error messages or warnings occurred, follow the instructions described in chapter 6.3, page 6-2.

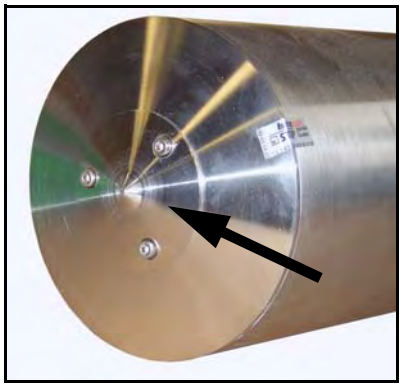

Fig. 5.2-1: Protective flange

5.3 Periodical probe maintenance by Endress+Hauser Conducta GmbH&Co.KG Division STIP

For preventive purposes the STIP-scan probe should be yearly maintained at Endress+Hauser Conducta GmbH&Co.KG Division STIP. With this maintenance, the STIP-scan probe is checked for function and leaks. Additionally, seals and the desiccant cartridge are exchanged and the quartz tube, and the optical components of the probe are serviced. Finally, a full performance test is performed. The activities of the annual maintenance work at Endress+Hauser Conducta GmbH&Co.KG Division STIP are listed in table 5.1-1 ("Maintenance plan of STIP-scan for standard applications)" on page 5-1.

1) A monthly check is recommended at standard application. A standard application is regarded as a measurement of waste water with predominant municipal parts or as installations in aeration tanks or outlet monitoring. For other applications, especially industrial waste water shorter maintenance intervals may be required.

6 Troubleshooting

6.1 Overview

This chapter describes the potential error and warning messages, their possible causes, and appropriate remedial action.

For STIP-scan analyzers, there is a difference between error and warning messages.
A warning appears on a yellow background, and an error appears on a red background. Also, the word ERROR or WARNING will appear in the title bar of the message.

Fig. 6.1-1: Warning

All error and warning signals are activated via the relay contacts. The assignment of the outputs can be set in the **SETTINGS** menu (chapter 3.3.5.6, “RELAY CONTACTS submenu” (page 3-31)).

6.2 Definition and handling

WARNING

If certain user-specified upper or lower limits are exceeded during operation, a *warning* message is issued. As the system is not significantly affected by a value being outside the limits, the analyzer does not enter the standby mode, and operation is not interrupted in the event of a warning.

ERROR

An *error* refers to malfunctions that have a significant adverse effect on the system, particularly on the measurement. The measuring operation (operation mode) is therefore interrupted upon the occurrence of an error. Two or more errors can never occur at the same time, as every individual error stops operation. Consequently, only one error message will appear on the display at any time.

An error message signifies a technical failure. The cause of the error must be removed and the operation of the analyzer must then be restarted manually. Operation is activated through the service menu “START MEASUREMENT submenu” on page 3-9.

6.3 Possible warning and error messages

6.3.1 Possible warning messages

The STIP-scan can issue the following warning messages without interrupting the program:

Tab. 6.3.1-1: Possible warnings

warning message	possible causes	remedial action
ABSORPTION TOO HIGH	Absorbance (average value within the wavelength range of the evaluation) after the settling process is > 250 m^{-1}	NA
AIR IN MEASURING CELL	Air has entered the measuring chamber due, for instance, to a lowering of the water level. If the air in the measuring chamber cannot be removed within four filling attempts, the warning is replaced by an error message, and operation is interrupted.	Position the probe slightly lower in the water so that no air can enter the measuring cell. (If an error is triggered, see table 6.3.2-1 AIR IN MEASURING CELL
NITRATE VALUE TOO HIGH	The nitrate measuring value lies at > 23 mg/l. Above this value, the values provided by the polynomial are not accurate enough.	NA
NO SLUDGE SETTLING	Sludge does not settle. No further sludge parameters can consequently be determined.	Increase the settling time (**SETTING** menu).

6.3.2 Possible error messages

The following error messages will cause the operation of the STIP-scan Analyzer to be interrupted:

Tab. 6.3.2-1: Possible error messages

display	possible causes	remedial action
AIR IN MEASURING CELL	Air has entered the measuring cell due, for instance, to a lowering of the water level. If the air in the measuring cell cannot be removed after four filling attempts, this fault message is triggered.	Position the probe slightly lower in the water so that no air can enter the measuring cell. Contact your service technician of Endress+Hauser Conducta GmbH&Co.KG Division STIP, if necessary.
LEAKAGE	The leakage sensor has detected water inside the probe.	Remove the probe from the wastewater. Check for any leakage and remove. If necessary, contact your service technician of Endress+Hauser Conducta GmbH&Co.KG Division STIP.
NETWORK FAILURE	The computer cannot communicate with the probe. The control cable is not correctly connected to the probe or the computer.	Check the communication interface, the RS232/RS485 converter and the connection of the control cable. If necessary, contact your service technician of Endress+Hauser Conducta GmbH&Co.KG Division STIP.
NO COM PORT AVAILABLE	No COM interface was identified while starting the STIP-scan software.	Check which RS232 cable is connected with the corresponding STIP-scan probe. Then go into menu SETTINGS – INTERFACE and check, if the correct COM interface is chosen. Contact your service technician of Endress+Hauser Conducta GmbH&Co.KG Division STIP, if necessary.
NO LIGHT SIGNAL	In case of a defective lamp, high-voltage generator, or spectrometer, no measured signal may be generated.	Contact your service technician of Endress+Hauser Conducta GmbH&Co.KG Division STIP.
NO VALID REFERENCE	Reference measurement with distilled water was incorrect.	Contact your service technician of Endress+Hauser Conducta GmbH&Co.KG Division STIP.
OUTPUTS FAILURE	The analog outputs or relay contacts are faulty.	Contact your service technician of Endress+Hauser Conducta GmbH&Co.KG Division STIP.
STEPPER FAILURE	The stepper motor moving the piston is defective, or faulty piston rings.	Start the program again and contact your service technician of Endress+Hauser Conducta GmbH&Co.KG Division STIP.

(This page intentionally left blank.)

CE

EC-Conformity Declaration

In sense of the Council Directive 89/336/EEC
and the Council Directive 73/23/EEC with
Council Directive 93/68/EEC

Name and address of the manufacturer:

Endress+Hauser Conducta GmbH&Co.KG
Division STIP
Online-Analyzers

Siemensstrasse 2
64823 Groß-Umstadt
Germany

Product name:

STIP-scan Analyzer

The product is conform with the council directives of

Council directive 89/336 EEC
on the harmonization of the laws of the Member States
elating to electromagnetic compatibility

The compatibility with the directive is proved that the described product comply the following standards:

DIN EN 61326 (DIN EN 55011, class B)
DIN EN 61000-4-2, -3, -4, -5, -6, -8, -11

This explanation is NOT an assurance of characteristics as defined by the product liability rule. The safety regulations are to be followed.

07/04/03 

date technical director

USA	Canada	Mexico
Endress+Hauser, Inc. 2350 Endress Place Greenwood, IN 46143 Tel. 317-535-7138 Sales 888-ENDRESS Service 800-642-8737 Fax 317-535-8498 inquiry@us.endress.com www.us.endress.com	Endress+Hauser, Canada 1075 Sutton Drive Burlington, ON L7L 5Z8 Tel. 905-681-9292 800-668-3199 Fax 905-681-9444 www.ca.endress.com	Endress+Hauser México, S.A. de C.V. Av. Gustavo Baz No. 43 Fracc. Bosques de Echegaray Naucalpan de Juárez, C.P. 53310, Estado De México Tel. (52) 55-5371-1110 Fax (52) 55-5371-1128 mexico@mx.endress.com

Endress+Hauser

People for Process Automation

BA 420C/24/ae/01.07